The Minnesota Office of Higher Education Final Report
Grant number 6142 Tuning Project
Grant period March 19, 2009 through February 28, 2010

The Tuning Process is a faculty-led initiative to involve students and employers in creating better alignment between students' mastery of agreed-upon learning objectives for specific degrees and workplace relevance. This pilot project is designed to lead all higher education stakeholders to a broadly shared understanding of the subject-specific and transferable knowledge and skills that students must demonstrate upon completion of a degree program.

The objective is not to standardize programs offered by different institutions but to better establish the quality and relevance of degrees in various academic disciplines.

Potential benefits arising from the Tuning process include:

- making higher education more responsive to changes in knowledge and its application
- establishing the relevance of postsecondary programs to societal needs and workforce demands
- aligning the roles of higher education institutions
- simplifying the process for students transferring credits between institutions
- facilitating retention, especially among students from underserved groups, by creating clear pathways to degree completion

1. Team Members

The detailed contact information for the Tuning Team members can be found in Attachment A.

Biology Team

Team Leader: Alison Wallace, Biosciences Department, Minnesota State University Moorhead
Team Members:
Craig Longtine, Professor of Biology, North Hennepin Community College
Michelle Malott, Biosciences Department, Minnesota State University Moorhead
Charlie Murphy, Student, North Hennepin Community College
Jonathan Shaver, Professor of Biology, North Hennepin Community College
Susan R. Singer, Professor of the Natural Sciences, Carleton College
Robbyn Weaver, Student, North Hennepin Community College
Brian Wisenden, Professor, Biosciences Department, Minnesota State University Moorhead
Robin Wright, Professor of Genetics, Cell Biology, and Development, University of Minnesota-Twin Cities

Graphic Arts Team

Team Leader: Kate Maple, Assistant Dean, College of Design, University of Minnesota-Twin Cities
Team Members:
Gale Bigbee, Graphics Production Instructor, South Central College
Craig Bjerke, Instructor, Alexandria Technical College
James Boyd-Brent, Associate Professor, College of Design, University of Minnesota-Twin Cities
Bart Engelstad, Student, Alexandria Technical College
Andrew Graham, Bemidji State University
Barbara R. Hanus, Coordinator of the Design Technology Program, Bemidji State University
Bonnie Higgins, Associate Professor, Technological Studies department, Bemidji State University
Brad Hokanson, Associate Professor, College of Design, University of Minnesota-Twin Cities
Paul Johnson, Instructor, Alexandria Technical College
Kevin McLaughlin, Commercial Art Instructor, South Central College
Neil Nurre. Graphics Production Instructor, South Central College
Myron Sahlberg, Instructor, Alexandria Technical College

2. How each subject-area work group went about the Tuning process?

Teams met several times during the grant period.

Scheduled Meetings Biology Team

Date	Location
April 6 and 7, 2009	Chicago (kick-off meeting)
June 3, 2009	Moorhead
October 2, 2009	Twin Cities
November 13, 2009	Northfield
December 3-4, 2009	Washington, D.C.

Scheduled Meetings Graphic Design Team

Date	Location
April 6 and 7, 2009	Chicago (kick-off meeting)
May 11, 2009	Alexandria
July 22, 2009	Bemidji
September 18, 2009	Mankato
October 23, 2009	Twin Cities
December 3-4, 2009	Washington, D.C.

Agendas and minutes can be found in Attachment B.

2 a. Why did your state choose to participate in the Tuning project? What problems or issues did you hope to address?

Minnesota was pleased to be given the opportunity to pilot the Tuning Process. Although, the short timeline proved challenging, the process of convening faculty from many different sectors to discuss teaching and learning in the context of a discipline could result in greater understanding and mutual respect between faculty which in turn could yield greater alignment of the curriculum. The fact that the process of discussing curriculum and pedagogy was faculty led increased our confidence that any results of the pilot or subsequent efforts were more likely to be endorsed by other faculty and the faculty organizations.

One issue that has been a source of complaints for decades by students and the legislature has been the transferability of credits between one college and another. Particularly, from the two-year public sector to the four-year public sector. The legislature has passed laws to make the transfer of credit easier. The two-year public technical and community colleges and the state universities were merged several years ago in part to make the transfer of credits easier and to promote greater alignment and seamlessness for students. The new system, the Minnesota State Colleges and Universities worked with the University of Minnesota to develop the Minnesota Transfer Curriculum (MnTC) which has eliminated most transfer issue in the lower division General Education area. However alignment within the disciplines/ majors is not as advanced. The state of Minnesota was interested in testing whether enabling faculty to meet and work through the Tuning process could enable greater alignment of the core while preserving the unique aspects of the degree requirements that are part of the strength of American higher education.

A second benefit was the opportunity to increase the communication between business and the postsecondary institutions in order to help orient students to what is needed by the business sector and to engage the support of the business sector in the education of students through internships, summer jobs and work placements.

A third benefit would be the increased clarity of the communication to students regarding what knowledge and skills they will be expected to demonstrate in their discipline and how the knowledge and skills will be used in their future careers.

Comments from members of the Graphic Design Tuning team:
Instructors from all these institutions have many things in common. They love design. Many are educated in similar institutions from around the country and the world. All are connected in one way or another to the design industry. We just happen to teach in different educational settings, which happen to have political, pride and competitive issues to overcome in order to work together. "
"The Tuning process has brought to the surface our common ground. In fact we have grown to appreciate one another as people in our common effort to train students to enter the design field. We want to work together because it just seems right for us, for our students, for our industry, for our state, for our world. It **IS** as simple as that."
"We at South Central College approached the Tuning Project with some skepticism. However, after our second meeting we were hooked and proceeded enthusiastically in a positive manner. We enjoyed meeting others in the program and going to their colleges and visiting with their students, administrators, etc. While we all have a little bit different attitude towards our mission, we all were striving to find similarities and the end product was quite fruitful. We met the challenges and look forward to seeing how our hard work will move forward.
Comments from the Biology Team:

Higher education institutions in the state of Minnesota have not identified any specific problems or issues with undergraduate biology education besides the need to be aware of and respond to national trends in undergraduate science education reform.

The Minnesota Tuning Biology Team members have all personally been involved in various partnerships and collaborations (some examples described below), and recognize the value in working with others to benefit from what other have done and to avoid "reinventing the wheel" when it comes to thinking about undergraduate biology programs. The opportunity to foster additional collaborations was the appeal for our state to form a biology team and become involved in the Tuning project.

2 b. What, if anything, happened in your state as a result of engaging in the Tuning process that might not otherwise have happened? (For example, were there unexpected outcomes of the collaboration among institutions, including work on transfer and articulation, conference/academic presentations, or other efforts or discussions that emerged as a result of Tuning?)

Although the faculty invited to the Tuning meeting in Chicago in April were initially skeptical about the process, by the end of the meeting they had started to form a more enthusiastic team and were starting to plan their strategy to accomplish the tasks outlined in the Tuning process. This was an opportunity for the faculty members from the range of institutional types to gather to discuss their discipline. The benefits were immediately evident as they described to each other their teaching process, the resources their college had available to students and the special emphasis they supported at each college.

Each team subsequently decided to hold additional meetings at each institution involved. These meetings included a tour of the department. Simply seeing how others organized their lab space and classrooms was informative. Mutual respect grew at each meeting as members viewed their colleague's classrooms, equipment and student work. This sharing increased the trust within the group, and led to more detailed conversations about the transfer process and how to solve some of the identified problems. Learning about the various approaches to challenges was inspirational and helped them consider a broader variety of solutions.

Conversations about the material taught at each institution revealed a universal agreement on the key goals and skills to be taught at each college. Although there were discussions of definitions of terms, there was little disagreement on the pattern of skills that the students needed to learn.

Both discipline teams enjoyed their exchanges and gained so much from their interactions that they wanted to share the information and experience with their fellow faculty members in their discipline across the state for all sectors. Each group wanted to hold a statewide cross-sector conference for their discipline to discuss the Tuning process and discuss what they had learned. Initially these conferences were to take place in June or July 2010 but each team wanted to maintain momentum. Therefore, the conferences are currently planned for April 30, 2010 for the Graphic Design Team and May 21, 2010 for the Biology team.

Comments from the Biology Team:

The value of interacting with faculty from such a variety of institutions was clear immediately. It was interesting to see how similar we were, particularly in our goals for our students and our interest in excellence in teaching. Learning about the various approaches to challenges was inspirational and helped us consider a broader variety of solutions. In addition, visiting one another's institutions was also very useful. Simply seeing how others organized their lab space and classrooms was informative.

As a result of the Tuning Project, the University of Minnesota submitted a proposal to the HHMI that includes development of a statewide conference on biology education. This conference will be held regarding funding outcome. We are also collectively establishing a new organization called MnCUBE (Minnesota Consortium of Undergraduate Biology Education) to promote ongoing interactions among biology educations at post-secondary institutions.

Comments from the Graphic Design Team:

The Tuning project promoted collaboration even outside of the Tuning arena. Within the Graphic Design team, Alexandria Technical College (ATC) and South Central College (SCC) collaborated on two student projects since the initial April meeting in Chicago. The first joint project was completed during the first week of May. This student project involved ATC students designing a poster and then uploading their digital files to SCC's InSite workflow system. Students from SCC "preflighted" the posters and eventually reproduced one of the posters on a four-color press.

The second project was a large-format banner. ATC students designed a 2' x 5' banner to be output on a large-format printer at SCC. Again, the ATC students have uploaded their digital files to SCC's workflow interface via the internet. SCC students checked the digital files for potential errors, and then outputting the digital files on a large-format printer.

Students from both colleges are gaining actual experience using digital files in industry. This collaborative effort of the students working with live files and high-end equipment is mutually beneficial for both colleges.

2 c. How did Tuning complement work that already was going on in your state?

Minnesota has two public sectors, the University of Minnesota and the Minnesota System of Colleges and Universities. There is also a private college sector and a for-profit postsecondary sector. The institutions cooperate on a different level in each sector. The Minnesota System of Colleges and Universities convene faculty for their disciplines across that sector but don't invite faculty from outside their system. The University of Minnesota will gather faculty from their disciplines occasionally. The private colleges don't formally convene a group of faculty because they have a much more loose statewide governance system. The for-profit postsecondary institutions are businesses and tend not to share information as it is considered the business's proprietary information. Other than the convening of faculty with the Minnesota System and Colleges and Universities and to a lesser extent the gathering of faculty at the University of Minnesota, the state of Minnesota had no similar process in place before the Tuning process was piloted this past year. Tuning is therefore leading to an increased collaboration among institutions that have little or no prior communication regarding outcomes.

The exception would be in the STEM disciplines. Our state has a history of collaborative efforts among faculty from various institutions in the STEM (science, technology, engineering, math) areas through consistent involvement since 1989 by various institutions and faculty members (n=58) in Project Kaleidoscope (http://www.pkal.org). Other STEM collaborations demonstrate that Minnesota higher education institutions have a definite interest in reaching out to each other and to their communities. Several illustrative examples of the breadth and variety of these collaborations include 1) a partnership between Minnesota State University Moorhead and North Hennepin Community College for students to obtain a 4-year Biochemistry and

Biotechnology major at either campus, 2) a formal articulation agreement between MSUM and Minnesota State Community and Technical College (M-State Moorhead) to allow a 2+2 transfer from M-State to the MSUM Ecology and Evolutionary Biology program, 3) the association of 10 universities and colleges to form the Minnesota Teacher Research Network (http://www.mnstate.edu/trn/) to investigate the practices of beginning K-12 math and science teachers, and 4) the establishment of the BioBusiness Alliance of Minnesota (http://biobusinessalliance.org/), an industry-led organization dedicated to the advancement of bioscience-related industries in the state of Minnesota.

2 d. How did the array of institutional diversity affect the project? Also, were the right people involved?

The diversity of institutions was one of the key points that separated this project from other similar activities in the state. Having team members from two and four-year institutions as well as private and public (large and small) brought in new perspectives and broke down stereotypes. One very notable result of our conversations is the increased level of confidence we have in the core outcomes we all share. Meeting at different institutions was very beneficial so that we could see the environments within which others teach and their students learn. The state does not currently convene multi-sector groups for the purpose of improving educational delivery for disciplines, but based on the success of this project, Minnesota may attempt this with additional groups if funding can be found.

The people selected for the teams were effective and enthusiastic. Meeting at different institutions was very beneficial so that the faculty could see the environments within which others teach and their students learn. Perhaps additional administrators should be involved in future projects to facilitate any changes to the disciplines that might be recommended. One very notable result of the conversations was the increased level of confidence the faculty had in the core outcomes they all shared.

The "right" people were involved because they represent such a variety of institutional types, programs, and types of expertise. They are the key individuals who were already involved in curriculum development and reform at their respective institutions. It was quite useful to have some administrator perspectives as well as faculty perspectives in our discussions.

The project struggled to find an appropriate role for the students. While their voice is important, they did not play a major role in this project.

Here are comments from the students who attended the Chicago meeting:

Student A

"As far as student involvement, I hate to say that I don't feel as though we have a huge role, nor should we. If students were to attend future meetings, there probably will never be perfect timing. It is most difficult to meet at the end of the semester, however, than at the beginning. I do not know what role students should have besides voicing difficulties and frustrations with the current educational system. We are the ones saying, "I cannot find a job because I am not qualified enough" or "It is difficult for me to transfer to another institution" -- and then Tuning is working around that. Someone noticed that we were having a tough time. It seems like we are most beneficial as survey participants because faculty and employers are the ones driving the competencies. But this makes sense – we ARE the students, and we should not be determining what we should

be taught – we have no idea how to begin to know those things. We can only know what those things are once they are established and only then can we identity if we are indeed receiving the education we should per those competencies/standards. It is up for the faculty and employers to decide what they want students to know. I hope that makes sense."

Student B

"Involving students in Tuning would be a lot easier than it looks from the outside. It's very easy to communicate to students. I would say you could allow the students who were chosen to go to the conference to help choose the questions on the survey that would get asked to current students going to the educational institution. Those students (there were only 2 in our case) can then speak with their student senate and different departments to distribute the surveys to a much wider base. If a student walks up to another student and asks for 5 minutes of their time to fill out a survey, more often than not they will be greeted with a yes, and a complete survey. If the surveys are sent out from faculty, to students, over email, the students have a much higher chance of just reading the email and pressing delete before completing the survey.

The timing which works best for most students is when they are already at the college. In my case, at a community college campus, most students have an entire other life once their classes are done, and won't even think about school again until late, late in the evening or early in the morning when they are back for more classes. If selected students are able to present the survey to the student body more personally, at the educational institution, you would increase your amount of quality feedback by a lot. As far as timing for me, when I was asked to be a part of this, I told our Dean of Sciences I would be able to set aside any time to help with this that was necessary, I just needed to be told in advance about it. That still holds true now if you are in need of any more help on the student side of things."

Student C

"The report looks great. I know that it is a lot of information to cover but from the look of everything it is spot on. If I attend another Tuning meeting, I would like to see more students involved with the project. I felt a bit ignored during my stay in Chicago but I am definitely looking forward to the outcome of this project. I was affected by credits not transferring myself and felt like the credits I completed at my first two-year public technical college was a waste of time and money. When everyone is on the same page and offering the same programs, students' lives will be much more convenient. I am excited for the tuning organization to improve the educational system. "

2 e. How did each group go about formulating the outcomes that define the subject area? Please describe the approach used and submit meeting agendas, if possible.

Some minutes and agendas to the meetings can be found in Attachment B.

Each group had a designated leader but groups seemed to be so motivated that a leader was not overly taxed. The discipline outcomes were discussed at each meeting. One member served as the recorder. Mutually agreed

upon outcomes were recorded. The meeting minutes were distributed shortly after the meetings. The outcomes were reviewed and refined at each meeting.

The biology team shared the ongoing efforts at each of the institutions to articulate learning outcomes for biology majors by bringing the existing student learning outcomes for each of the programs to the discussion table. While this originally sounded like a daunting task, they were surprised to find it rather straightforward due to the remarkable degree of congruence among programs and institutions. They used a combined document as a starting point and edited the outcomes down to the list of biology competencies that were included in the Tuning survey. The University of Minnesota College of Biological Sciences language was used to summarize the "content" knowledge competency (Biology Competency #1). All of this work was accomplished at the June meeting.

The Graphic Design team discussed learning objectives and referred to the accrediting standards on NASAD (National Association of Schools of Art and Design) and standards developed by the University of Minnesota. The learning objectives were refined over several meetings.

2 f. Were disciplinary or professional organizations consulted?

The Graphic Design team examined the standards for the accrediting organization NASAD (National Associations of Schools of Art and Design) and the standards developed by the University of Minnesota. The Biology team consulted the learning outcomes developed for each institutions discipline. The Tuning teams also used the services of the Postsecondary Education Research Institute (PERI) at the University of Minnesota. PERI volunteered to analyze the survey data for the Tuning teams. Their report can be found in Attachment E. There were no paid consultants.

The Minnesota State Colleges and Universities have been collaborating with Project Kaleidoscope (PKAL) to integrate pedagogies of engagement into the curriculum more deeply (http://serc.carleton.edu/sp/pkal/mnscu/index.html). PKAL is an organization focused on undergraduate science education reform. Members of the Tuning Biology Team attended the NSF/AAAS Vision and Change Conference in Undergraduate Biology Education in Washington, DC in the summer of 2009 (http://www.visionandchange.org/). The conference brought together biologists from across the country to envision the future of biology undergraduate education. The Minnesota biology Tuning team plans to create MnCUBE and have annual, state-wide conferences on biology undergraduate education. The idea for this conference was inspired by the NSF/AAAS Vision and Change Conference and the Minnesota Tuning project. The Biology Team also relied on information from National Academies' work, including the Promising Practices in Undergraduate STEM Education workshop (http://www7.nationalacademies.org/bose/Promising%20Practices_Homepage.html) that was chaired by one of the Tuning group members. Consensus reports, including BIO2010: Transforming Undergraduate Education for Future Research Biologists (2003, National Academies) and the AAMC/HHMI Scientific Foundations for Future Physicians (2009) which established competencies for future physicians, informed their work. The Tuning group members also relied on information from their professional research societies that have active education committees.

2 g. If your state picked a subject area or subject areas that had previously been "tuned," to what extent did you rely upon existing Tuning materials from Europe or elsewhere? How helpful was the advice from European experts?

Biology and Graphic Design had both been previously tuned in Europe using the Bologna Process.

The examples provided by Lumina Foundation for Education were incredibly useful. They provided clear models of exactly what "Tuning" is. These resources made the work much easier and more efficient. The team didn't have to wrestle much with what was expected. The Biology Team referred to UK Biology example to inform their thinking about the level of specificity for the competencies.

Graphic Design had been previously tuned but the European report for Graphic Design seemed too wordy. A member of the Graphic Design team used the work of the NASAD National Association of Schools of Art and Design Handbook 2009–2010 to guide some of the work. They followed that format for major portions of our report.

2 h. If your state picked a subject area or subject areas that had not previously been "tuned," how did this affect the project?

Biology and Graphic Design had been previously tuned in Europe.

2 i. In what ways were students involved in your Tuning work? What input or feedback did students provide, and how was it provided? What weight was student participation and input given?

Three students attended the initial meeting in April in Chicago mainly as observers. They were enthusiastic about the project but could not be very involved because of the short time period. They had to attend class and study for exams and didn't have time to attend meetings outside of their institutions. Graphic Design students were interviewed and presented their portfolios to the Graphic Design team as they attended different institutions throughout the project. The interaction with students and the portfolios presented confirmed and help build the trust between Graphic Design faculty members that skills and topics being taught across institutions supported the notion that students transfer between institutions should be supported. The Biology team talked to students during the department tours.

The original students involved in the initial April Chicago meetings were asked to review and comment on the final Tuning report and their comments are incorporated.

Numerous students took the survey. No students were available to attend the June meeting in which the Biology Competencies were developed.

2 j. What barriers or obstacles did each group encounter? (For example, how did state budget cuts affect the project?) How were these challenges addressed?

One of the biggest barriers was the short timeline of the project. Selecting team members, attending meetings, and writing reports took place over a very short period of time considering the tasks to be accomplished. Whereas, some states may have already had statewide groups in place or had fewer sectors to deal with, Minnesota did not have any of this in place prior to receiving the Tuning grant. In addition some of Minnesota's faculty are unionized. Those unions were concerned that they did not have the opportunity to be involved with

selecting the faculty participating in the project. The short timeline prohibited their participation in this way. If Tuning is repeated in the future in Minnesota for other disciplines, the faculty union will have to be more involved.

The state budget cuts did play a factor in that faculty had additional responsibilities which created some difficulty in selecting meeting times. Also, institutions would not have been able to support the faculty travel, meeting costs or faculty stipend to support the work done and so the Lumina Foundation for Education grant was essential to the completion of this pilot project.

If Minnesota decided to Tune disciplines statewide, the effort would require years not months of effort. There were numerous obstacles encountered given the rushed nature of this project.

a. There really wasn't enough time to involve broad discussions with faculty or students. For example, most of our work took place over the summer, when few students were on campus.
b. It took way too much time to get IRB (Institutional Research Board) approval for all of the institutions, especially given the fact that the work was being done over the summer and approval was slowed down considerably.
c. There was not a lot of time to gather the e-mail addresses of alumni and employers, and in some cases, the addresses provided were not correct so follow-up was needed. All of which limited the window of time for participants to take the survey.
d. There was even less time to get the survey up and running and provide participants with ample time and encouragement to consider taking the survey.
e. There were cases of technical difficulties that could have been prevented had the survey administration been contracted out.

2 k. What were viewed as the strengths/weaknesses of the process?

Strengths:

The faculty members involved were really excellent colleagues, and were dedicated to exploring the possibilities of using this process. They all became aware of the Lumina Foundation and its goals.

The opportunity to learn about international trends in higher education, especially at the Chicago meeting, was also a strength.

Weakness:

Certainly the biggest weakness was the timing of this project and the time given to complete this project. First, asking faculty with little prior warning to attend the out-of-state Chicago meeting was an issue. Additionally, the timing of the first meeting was unfortunate because it took place at the end of a semester. It was very difficult at this time of year for faculty to leave campus because they are trying to help their students complete their final project and complete final tests. Second, asking faculty to work on an additional project over the summer when they had already arranged their summer projects (which include summer educational camps and study abroad trips) was difficult on faculty. Third, the overall completion time for this project was very short leaving little time to construct and give a survey to students, faculty, and businesses and to write the final report.

On top of the overall short time period, the second shortcoming was the often convoluted timing of the

instructions. For instance, the timing and location of the April meeting was uncertain giving people a short time to purchase plane tickets. After the meeting time and location was selected, state coordinators were asked to have the team leaders stay later than other members for a separate meeting after the conference. In Minnesota this created two problems. First since the team members were just barely selected and had not yet met, no leader had been chosen. Secondly, team members had already purchased their plane tickets and would have to pay additional funds to reschedule flight times in order to stay later after the conference.

There was a similar problem with the documentary film makers. In both the April and the December meetings they contacted the team members after the meetings had been announced and in some cases after the team members had purchased their plane tickets. If the film makers had contacted the team members before or at the same time as the meetings' locations and dates had been announce, travel logistics would have been simpler and plane tickets would not have to be re-written.

As stated above, there was insufficient time to do the work properly. The project should have factored in some lag time to accommodate understanding exactly what was expected.

If there had been more time available for contract negotiation, the survey would have gleaned better results if it had been professionally administered.

Another challenge was getting campus IRB (Institutional Research Board) committee approvals in a timely way for conducting the survey of students and faculty. The entire survey process was cumbersome and should be revisited.

2 l. How does the process differ from other learning outcomes efforts?

As stated previously, one of the strengths of Tuning is the focus on faculty as the drivers of the process. The pilot teams were composed of and led by faculty, not administrators. While faculty have always been primary in any review of curriculum and learning outcomes, other efforts have usually emanated from sources external to the faculty - a provost, dean, chancellor, accrediting agency, governing board or even the legislature.

A second difference is in the process itself; Tuning has a language and a set of processes that are highly uniform. While initially "off-putting" due to the complexity and the fact that it was created in the European higher education context which is different from that in the United States, there are benefits to a language and process that can be used by faculty from multiple disciplines and varied institutional types. We do recommend, however, that the way the Tuning process was introduced to faculty be significantly altered from the process used in Chicago. Faculty who had just barely been introduced to the Tuning concept and who did not know who or what the Lumina Foundation was, were being told what they would do by which deadline. At that point in the project some of the faculty had not even met each other. They had not even been in a room together to talk and star forming a team. There was initial push back from faculty against the directives being given to the faculty.

There are ongoing discussions about student learning outcomes within the institutions. For instance, all of the curricula have changed over the years to become more in step for biology with national science education reform initiatives, but the timing has been on an individual institution basis. For instance, in the Biology Team it was discovered that the biology introductory level course sequences had become more process-driven and inquiry-based. The private school team member stated that her institution made this change about 25 years ago.

The public 4-year institutions changed their curriculum in the past 10-12 years. The community college change was more recent and was done in the past 5-7 years. Thus "tuning" on an informal basis appears to have happened already at each individual institution, and was largely inspired by national initiatives.

This Tuning effort differs in that it intentionally included collaborations among different institutional types, involved student and employer perceptions, and was much broader than the efforts of our individual institutions.

2 m. If one or more of your work groups deviated from the process outlined during the Chicago convening, please explain these changes and why they were made so that we have a better understanding of how Tuning applies in the Tuning process?

The pilot process was so short that it was impossible to ensure a good rate of completion and review the survey information before the final report deadline. The ideal process would have allowed enough time for the survey data to enlighten the development of the learning outcomes. The short time period also precluded student participation. If there had been more time the teams might have at least included focus groups for students to have more input in the Tuning process.

The funder didn't seem to know what was required of the project before the project was started. The initial Tuning pilot project took place at the wrong time of year. A better pattern would have been to start in the fall term (after sufficient warning so faculty could be selected in advance), do the survey in the spring when students are in class, and then analyze the survey data in the summer and finalize and map the learning objectives through the summer. As it turned out, the final meeting for the project is taking place in December, again pulling faculty away from their campuses during finals week.

The required final report product was not articulated until October and the report was due in November. The teams needed to begin writing the report before the survey results were analyzed. In the period of time allotted, the teams were able to do the first two steps in the Tuning Process. A more satisfactory process working through all of the steps should be a multi-year process.

Survey process and delivery was somewhat ad hoc. At the April meeting in Chicago a survey research company was presented as if the company had been hired to help with the survey. Later it was discovered that each state would have to contract separately with the research company. However, because state rules would require an RFR and at least three months of contract process time, teams elected for volunteer help from the University of Minnesota instead. In addition, the IRB committees at each institution had to approve the survey before it could be used. The survey had to be designed and the survey process outlined before the IRB committee would hear the request for approval. The IRB committee only met once a month or not at all over the summer. With the delay in surveying, the volunteer help, and the final deadline for the project, the time to conduct the survey and analyze the results was non-existent.

Repeating the survey over a longer time period and with more potential participants is appealing. Then the trends that come out of the survey results could be used to stimulate focused discussions among institutions, with students and with community and business organizations.

Another next step is to consider the assessment of the competencies. It was relatively easy to define them, but determining how to measure the degree to which the students achieve these outcomes will be much more challenging. Perhaps employers can be a regular part of program assessment and provide input on the effectiveness of the degree programs. There is a spectrum to be acknowledged for each competency that depends on the programs, the availability of resources, and the student populations.

2 n. What lessons have you drawn from this project? What differences, if any, were there in how the process was perceived by the SHEEO office? Participating faculty members? Non-participating faculty members in the disciplines with participating faculty members?

We learned that faculty would quickly form functioning teams around the goal of the project once they were allowed some time to talk to one another. Although other states selected faculty teams that were already in place, Minnesota constructed cross-sector faculty teams who had not met previously and who needed time to form a team. The time between selecting the members of the team and attending the Chicago meeting in April was so tight that the faculty in the teams had not had a chance to meet one another. An initial meeting in Minnesota would have eliminated some of the anxiety shown in Chicago.

We learned that faculty didn't know who the Lumina Foundation for Education was and they were initially suspicious of the motives behind the project. If Lumina sponsors additional faculty projects, the faculty must learn to trust the foundations motives before they will concentrate on the project funded by the grant.

The Office of Higher Education learned that facilitating the Tuning teams took more time than was expected even though it was supposed to be a faculty led process. The agency staff was required to take quite a bit of time answering faculty questions regarding the project requirements, arranging meetings, and negotiating contracts necessary to pay stipends to faculty and shorter contracts for students to review the final report. All staff except the director provide their own support regarding arranging meetings, plane flights and other contract support activities including purchase orders for hotels and food before each meeting, therefore support for the faculty meetings took quite a bit of time.

As stated earlier, Minnesota postsecondary enterprise has two very strong faculty unions. These unions will want to be more involved with the Tuning process than was possible with the pilot process given the short timeline. The involvement of unions will take additional administrative time. If the agency continues to administer the Tuning project particularly if it is for several Tuning teams, the agency will need to add additional staff to provide support for this project.

3. Suggestions of next steps for advancing these discussions.

3 a. Do your subject-area work groups intend to continue this work? Why, or why not?

The faculty teams immediately saw the benefits of discussing their discipline with faculty from other institutions. Within the first few meetings they started talking about having a statewide all-sector conference to discuss the Tuning process, teaching innovations and approaches, learning outcomes and the transfer of college credits between institutions.

The Graphic Design Tuning team was so interested in continuing the effort that they designed a flyer to advertize the coming Graphic Design statewide conference. They want to use the theme "WHAT IF". The sample flyer is Attachment F. This is a sample created by the team. If it is used more extensively, the Minnesota System of Colleges and Universities and the Lumina Foundation for Education should be added to the list of sponsors.

3 b. What do your state's work groups view as the next logical steps for expanding and deepening the Tuning work?

The Tuning discipline teams have started planning for statewide conferences for each discipline even before funding has been secured. They are enthusiastic about the Tuning process and their enthusiasm will inspire and encourage other disciplines to start the Tuning process. They plan to share the outcomes of the pilot in a statewide conference and invite participants to discuss how to use this information to improve their disciplines in Minnesota.

3 c. If you could do further work in this area, what would it be?

The benefit of cross sector statewide meetings has been proven with this pilot project. If the Tuning process is to take place in Minnesota on a level other than a pilot, then the state of Minnesota will need to find funding for additional Tuning projects. Additionally, they will need to involve more faculty members in a process that is acceptable to the faculty to allow for influence on any educational delivery changes. Members would have to be selected in a way that is acceptable to the faculty unions. All faculty members in the Tuned discipline would have to be informed as the process progressed and the results would need to be presented to them so they can alter their educational outcomes if necessary.

Repeating the survey over a longer time period and with more potential participants is appealing. Then the trends that come out of the survey results could be used to stimulate focused discussions among institutions, and with community and business organizations. Another next step is to consider the assessment of the competencies. It was relatively easy to define them, but determining how to measure the degree to which our students achieve these outcomes will be much more challenging. Perhaps employers can be a regular part of program assessment and provide input on the effectiveness of our degree programs. There is a spectrum to be acknowledged for each competency that depends on the programs, the availability of resources, and the student populations.

3 d. Who needs to hear about this work, and why?

Certainly the legislature needs to hear about this work. The national SHEEO organization needs to hear about it so it can be promoted in each state. College administrators need to hear about and understand the process. Faculty need to understand the Tuning process and hear of the results.

The Tuning team Discipline reports found in Attachment C and D contain information about learning outcomes by subject area and level of discipline in terms of subject specific outcomes and transferable skills and general competencies.

Faculty, staff, administrators, advisers, parents, career centers, employers, and government agencies (including legislators) would all be interested in learning about the degree to which various groups (students, faculty, employers, and alumni) agree on the importance of various competencies. In cases where there are disagreements, it would be useful to facilitate discussions to explore the reasons for the mismatch in expectations.

4. A clear expression of learning outcomes by subject area and level for each discipline, both in terms of a.) subject-specific outcomes and b.) in terms of transferable skills/general competencies.

(NOTE: To the extent possible, please clearly separate the transferable skills or general competencies by degree level.)

This information is found in the Tuning Discipline team reports found in Attachments C for the Biology report and D for the Graphic Design report.

5. Map of subject-area degrees to employment fields or professions, with explanations of how potential jobs for graduates were identified.

This information is found in the Tuning Discipline team reports found in Attachments C for the Biology report and D for the Graphic Design report.

6. Report on survey results from students, recent graduates, employers and faculty members and how these were used in deliberations.

6 a. How did you go about surveying students?

Current and graduated students, faculty within the disciplines at the team member institutions and businesses that hire students were contacted by email and asked to go to a website and complete the survey questions.

Each institution obtained lists for their current students. In most cases, students were sent a preannouncement with a personal note, and then a follow-up e-mail reminding them to click on the link and take the survey.

6 b. How did you identify recent graduates to survey?

Graduated students were identified by faculty members who had their email addresses, by the alumni centers of each team member's institutions, and by the central office of the Minnesota System of Colleges and Universities.

6 c. How did you identify employers to survey? Who responded to your employer surveys? HR? Hiring managers? How might this have affected outcomes?

Employers for the Graphic Design students were identified by faculty members who knew a student had been hired from their institution. Also, email addresses were provided for businesses that could or might hire their students. The Career Centers at each institution were able to provide email addresses for the people who contacted the college about hiring students.

The biology team did not send survey invitations to employers (both MSUM and NHCC did invite employers to participate) because the students at two-year colleges transfer to four-year colleges and students at four-year colleges go on to graduate school. Few students enter the job market before graduate school.

Because responses were anonymous, it is impossible to tell who responded. With such a low number of responses, interpretation of these data should be done with caution because it is not known whether or not responders constitute a representative sample across subfields.

6 d. Did you use the European survey or design your own? Why, or why not? If you used the European survey, did you add optional questions? Why or why not?

The teams used the European survey because they were unaware of other options. Some members personally felt the European survey was not particularly well designed because it did not ask questions the team was particularly interested in knowing.

The teams thought they had to use the European survey so that the results could be more easily compared to the European survey results. For the general competencies, they used verbatim the survey that was labeled TUNING USA: General Competencies (Physics survey). They added our own subject-specific questions about competencies at the end of the survey.

6 e .Were problems encountered, if any? How could these have been avoided?

The time allowed for the survey was very short and the number of responses to the survey was fewer than would be acceptable to make statistically statements about the population being surveyed.

The main problem was the lack of time to complete the survey, encourage an increased rate of completion and analyze the results. With future Tuning projects this problem can be solved given additional time for the completion of the Tuning projects.

The team had trouble distributing the e-mails inviting people to take the survey. The fact that some categories/institutions received zero responses indicates there was a technical error that resulted in the non-delivery of some of the invitations (all of the Carleton College names and the U of M faculty). The invitations to Minnesota State University Moorhead alumni most likely ended up in junk mail folders, due to a few comments and messages sent back from the institution's Internet service providers.

The team could have mitigated these distribution problems if the team had access to professional expertise to plan and execute the administering of the surveys. The response rate might improve if they had more time to give people to consider participation by sending out one or two more reminders.

The timing was difficult for the execution of the process because it spanned the summer months when obtaining information from academic institutions sometimes becomes more difficult. Once the fall semester began in September, the teams had to make sure the survey was ready to go, each of the participating institutions had to apply for and obtain IRB approval, and the teams needed to assemble lists of current students, alumni, and employers. Only then were the teams able to finally invite participants to take the survey, remind them to actually take it, and then submit the results for analysis. This did not allow for much time for careful analysis of the responses that did come in.

6 f. Are there other approaches Tuning participants should explore in the future for gathering this information?

Other approaches for gathering information from students, faculty and businesses would involve focus groups to discuss and pursue issues in more depth.

The team has already articulated that the timing (both in the total amount of time dedicated to the process, and the actual timing during the academic year) was a problem. Help administering the survey would improve the process.

A valuable piece of information that is relevant to the community colleges, and completely missed in the survey, is the reflections of students that have transferred to a university but did not graduate from NHCC. In fact, our best transfer students typically do not earn a two-year degree. They complete the set of courses required to move onto a four-year university and transfer without the two-year degree because it is of little value to them.

The analysis of the survey data would be more useful if the rank order of the general competencies were separated by faculty, students, businesses, and institutions which was not statistically possible because of the low response rate. The teams had a number of questions about potential differences in prioritization rankings among these groups.

Because there are so many competencies, the analysts could consider the potential for grouping them and then doing cluster analysis to see how and where students, alumni, faculty, and businesses differ in their experiences and expectations.

The final analysis of the results should include focus group discussions to follow-up on themes that emerge from the survey. The survey could serve as the vehicle to identify discussion points, and point to the groups who would benefit from these discussions. The outcome of these discussions, and not the survey results, could then have a potential impact on curricula.

6 g. How were the survey results used to come up with the set of transferable skills graduates at various levels should have?

Since the time was so short and the results not statistically significant, the results of the survey did little to influence the results of the final report. Most of the biology graduates go to professional or graduate school, not to jobs so the Biology Team did not have many businesses to query.

The survey results could have been very useful. A quick look at the overall answers showed that faculty were out of sync with the student perceptions and the perceptions from business. Faculty are the outliers!

The Biology Team made the following comments:

> We agreed that the survey results would be more useful if we had gotten a better response rate, and consequently, higher sample sizes. The survey response rate was 6.8%, with 265 respondents in the following categories:
>
> - 75 Alums
> - 73 from University of Minnesota
> - 2 from Minnesota State University—Moorhead

- 160 Current Students
  - 113 from University of Minnesota
  - 47 from Minnesota State University—Moorhead
- 11 Faculty Members
  - 6 from North Hennepin Community College
  - 5 from Minnesota State University—Moorhead
- 19 Business
  - No identification on institutional affiliation

Our team members were selected based on the variety of institutions they represent, however due to technical difficulties and timing issues, the survey respondents do not represent this diversity. Thus, we approach the analysis of these survey results with a great deal of caution. Having said this, we were very interested in looking at these preliminary results and would be supportive of an expanded survey effort. The process itself would yield useful information, especially if followed up by focus group discussions, as mentioned above.

We did take note of a few broad trends in the current survey results.

General competencies: Students and businesses tended to agree with each other on the importance of the general competencies by rating many of them at the highest level. Faculty tended to rate the general competencies a step lower on the importance scale. Faculty also rated these lower than students and businesses did in terms of the "level of which developed by university or college degree", indicating high expectations for their programs and students that perhaps aren't met.

Here is one such example:

Ability to design and manage projects.*
Importance (4=Strong, 3=Considerable, 2=Weak, 1=None)

	1	2	3	4
Business (n=22)	0%	14%	41%	46%
Faculty (n-13)	8	15	54	23
Alum (n=81)	0	1	56	46
Student (n=174)	1	10	42	47

Ability to design and manage projects.**
Level to which developed (4=Strong, 3=Considerable, 2=Weak, 1=None)

	1	2	3	4
Business (n=22)	9%	27%	41%	23%
Faculty (n-13)	8	54	23	15
Alum (n=81)	0	26	50	25
Student (n=174)	1	16	49	32

Significance of Chi-squared tests of differences between respondent type, importance of competency, and level to which competency is developed: *p<.05,**p<.01, ***p<.001; percentages may not total to 100% due to rounding.

Biology competencies: There was more agreement among the respondents as to the degree of importance of biology competencies than there was for the general competencies. However, faculty again rated these lower than students and businesses did in terms of the "level of which developed by

university or college degree", indicating high expectations for their programs and students that perhaps aren't met. In this example, student perceptions were also lower than that of businesses.

Here is one such example:

Develops numerical, statistical, and graphical models to represent and simulate biological mechanisms *Importance (4=Strong, 3=Considerable, 2=Weak, 1=None)*

	1	2	3	4
Business (n=22)	0%	14%	46%	41%
Faculty (n-13)	0	0	46	54
Alum (n=81)	9	11	36	44
Student (n=174)	3	14	47	36

Develops numerical, statistical, and graphical models to represent and simulate biological mechanisms*** *Level to which developed (4=Strong, 3=Considerable, 2=Weak, 1=None)*

	1	2	3	4
Business (n=22)	14%	9%	36%	41%
Faculty (n-13)	0	39	54	8
Alum (n=81)	3	36	48	14
Student (n=174)	2	20	43	35

Significance of Chi-squared tests of differences between respondent type, importance of competency, and level to which competency is developed: *p<.05,**p<.01, ***p<.001; percentages may not total to 100% due to rounding.

Overall, we were encouraged to see that students and alumni responses largely matched, indicating that expectations and perceptions are aligned and consistent. The business perceptions were well aligned with that of the students. Faculty seemed to be more critical of the ability of their programs to develop these competencies.

It must be noted that in the comments section where the respondents can type in additional text, two of the business respondents indicated that they had selected "None" for all competencies because they did not feel as though they knew enough about the programs to indicate the "level of which developed by university or college degree". In retrospect, there should have been a "Not Applicable" or "Don't Know" option. Any significant differences in the responses to these competencies must be very cautiously interpreted in light of this artifact.

7. Write profiles of degree programs by institution. (It may be helpful to view these as half- or full-page pitches for your programs that are grounded in learning outcomes, including outcomes the program emphasizes beyond those agreed upon as part of Tuning. These also should include descriptions of where graduates are finding employment related to their degrees.)

Graphic Design

Alexandria Technical College

PROFILE FOR THE COMMUNICATION ART AND DESIGN, Students in the first year of the Communication Art and Design program learn to see as an artist SEES through learning the skills of drawing and painting. The students develop technical skills in design software (InDesign, Photoshop) on the Macintosh

computer. These technical skills are used in the process of learning the elements of design, typography skills and design applications in advertising and editorial design.

Students in the second year of the Communication Art and Design program learning additional software (Illustrator, Flash). They learn to apply their skills in type and design to print and web designs in corporate ID, package design, advertising, and collateral design. The students continue to develop hand skills in illustration and mixed media applications. The student prepares for employment opportunities by developing a portfolio and resume. The student will earn an AAS Degree when successfully completing the technical and general education requirements of the program.

A fifth semester program is available to graduates of our two-year program. It is specially designed to give the students experience in advanced web design, animation, multi-media and 3D illustration software. Students interested in illustration can take advanced classes in painting from life. A **Certificate in Advanced Multimedia and Web Design** is awarded for this fifth semester work.

Employment: Our students have found employment in corporate in-house art departments, advertising agencies – large and small, magazine and book publishers, greeting card publishers, newspapers, and self employment as designers and illustrators.

Examples of Places where our students work or have worked after graduating from our two-year program: US Steel Corporate Office, Disney Animation, Taylor Corporation, Herbergers Corporate Office, Target Corporate Office, Scheels Corporate Office, Tastefully Simple Corporate Office, Many Advertising agencies in outstate Minnesota and in the Twin Cities, and throughout the USA.

Awards: Our students have won over half of the awards at the American Advertising Federation show in central Minnesota every year since its inception about 20 years ago. Last year our students won 67 of 94 awards, including Best of Show and all three judges awards. In the job market graduates from our program continue to win many awards for their work.

What lessons were drawn from this exercise?

Lessons: The road to unity and agreement among state and private institutions in graphic design will be sweet and short in some cases, long and difficult in others. The outcomes of the programs for each institution in our pilot tuning process are amazingly similar. The perspectives and internal cultures of the University of Minnesota, state universities and state two-year colleges are quite different. Workload for instructors and students are quite different. Universities value graduate degrees for their instructors, two-year schools value work experience for their instructors more than degrees. Because of these very different perspectives two-year schools have a higher value for the practical application of design in choosing their instructors and in the outcomes of their students. Universities place the philosophy of design and research in design at a higher level. Two-year schools are immersed in preparing the student for the job market and are highly concerned that their instructors have work experience and stay in touch with the marketplace.

What challenges did this exercise present?

Challenges: Though we agree on so many things in our field of design, we know it will be difficult to fully appreciate each other's perspective on the educational process. Our outcomes are more similar than the politics and institutional requirements of the different systems. These institutional realities have deep roots that may be impossible to overcome, but we discovered great hope that we can work together cordially to help students achieve their goals without requiring major changes in any of the institutions. The Key is respect: knowing and respecting the capabilities and goals of the students. Knowing the instructors in the different educational institutions, respecting our mutual concern and care for students, accepting the fact that we all have very similar if not the same practical goals for our students in design knowledge and design skills.

Instructors from all these institutions have many things in common. They love design. Many are educated in similar institutions from around the country and the world. All are connected in one way or another to the design industry. We just happen to teach in different educational settings, which happen to have political, pride and competitive issues to overcome in order to work together.

In Minnesota we sometimes wonder how we got so many different educational institutions. It is a big question. We all compete for students and money. It isn't going to change anytime soon. It maybe should, but entertaining that possibility makes us all uncomfortable and insecure. It is what it is.

The Tuning process has brought to the surface our common ground. In fact we have grown to appreciate one another as people in our common effort to train students to enter the design field. We want to work together because it just seems right for us, for our students, for our industry, for our state, for our world. It **IS** as simple as that.

Bemidji State University

Design Technology at Bemidji State University is an innovative interdisciplinary applied design program that integrates the excitement of design and illustration with the knowledge and control of graphic technology. This Bachelor of Science degree couples a liberal arts context with a selection of program courses from two university departments; Visual Arts and Technological Studies. Beyond Design Technology's common foundation core and culminating core of courses, each student also acquires more specialized training within a major specialization area of digital design or exhibit design.

Design Technology students are involved in a full range of learning experiences from concept and design to production-ready digital files and specifications for production. The Design Technology curriculum focuses on the following:

- Professional application of visual design principles for production in digital design and exhibit design.
- Production time management as it relates to production deadlines and budgeting/estimating.
- Efficient management and research techniques for ideation flow and marketing analysis as it relates to the design solution.
- Professional communication techniques used with clients in individual or team production flow.

To emphasize the importance of the total liberal arts and program coursework, the program also requires a minimum overall G.P.A. of 2.75 after the completion of 1000-level major courses for students to remain and graduate with a Design Technology Bachelor of Science degree.

The program also works closely with over 50 professionals from across the United States that form Bemidji State's Design Technology Advisory Board. These professionals are dedicated the program and continually provide individual student portfolio evaluations and information about current trends in design and management to be included in the classroom. The constant demand for Bemidji State University's Design Technology graduates reinforces the belief that this total design approach provides students with a broad level of professional techniques that allow them to remain flexible in a variety of professional assignments. Graduates are currently working in a variety of settings across the United States such as in-house corporate marketing and design, marketing firms, exhibit and trade show design firm, advertising agencies, museum exhibition design, event design and management. Sample companies include ASI Communications, Best Buy, Brede Exposition, Carmichael Lynch, Colle + McVoy, Czarnowski, Display Arts Worldwide, DKY, Inc., Edge Exhibits, Fabric Images, Inc., Featherlite Exhibits, Flint Communications, Freeman Company, GES Expo, Hasbro, Inc., HT Klatzky & Associates, Kraus-Anderson Communication Group, Lime Valley Advertising, Marvin Windows and Doors, Pinnacle Publishing, Russell Herder, Science Museum of Minnesota, Skyline Exhibits, Spiira Design, Star Exhibits & Environments, Target Corporation, The Occasion Group/Taylor Corp., The Trade Group, W.A. Fisher, Wolfmotell, Ltd., Yamamoto Moss Mackenzie.

Since the 1970's when the Design Technology curriculum was first approved, the program faculty continue to up-dated the program every 5 to 7 years. This fall (2009) the program has again been restructured. The Tuning learning outcomes has allowed the Design Technology faculty to review the overall program's outcomes along with each course's outcomes from a broader perspective and design the program to better encourage articulation between Minnesota's 2-year technical design programs and the 4-year Design Technology program at Bemidji State. The biggest challenge in the Tuning process was that the overall outcomes needed to be somewhat generalized limiting their relationship to Design Technology's specialization of Exhibit Design. With Bemidji State having the only 4-year degree in Exhibit Design in the United States, we developed additional learning outcomes to program that will not be in the Tuning list.

South Central College

The South Central College Graphic Communications program is multifaceted. All students take cored courses in their first semester of study. After they have a feel for the career paths open to them, they can choose the design track or the production track. The design track concentrates on the various facets of designing for the World Wide Web, multimedia, print media, etc. The production track concentrates on the machines and software that are used to output to the World Wide Web, multimedia, print media, etc. Because both sides work with both software and hardware, the cored path was chosen to get students started and acclimated for their given field. The largest employer of our graduates are in the printing business but our graduates also have found employment in advertising agencies, web services companies, newspapers, shoppers, etc. Southern Minnesota has the largest population of printing firms in the state employing hundreds, if not thousands of people.

We at South Central College approached the Tuning Project with some skepticism. However, after our second meeting we were hooked and enthusiastically proceeded in a positive manner. We enjoyed meeting others in the program and going to their colleges and visiting with their students, administrators, etc. While we all have a little bit different attitude towards our mission, we all were striving to find similarities and the end product was quite fruitful. We met the challenges and look forward to seeing how our hard work will move forward.

University of Minnesota

The education of graphic designers in the College of Design is an intense studio experience supported by a broad range of courses at the University of Minnesota. Graphic design is one of seven majors that include clothing design, architecture, interior design, and landscape architecture; many of our foundation courses include students from these other areas.

Our progressive design studios often focus on real projects in both print and electronic based media. Each student develops a portfolio of work that is evaluated through classes, faculty review, external presentations, and a finishing exhibition of work. Skills developed by study in graphic design include technical and hand based skills as well as developing abilities in solving problems, critique, and critical thinking.

While most of our graduates directly seek work in the profession in design firms, corporations, and as independent designers, a significant number go on to graduate study in the field. And using the skills learned in a broad based design education, a number of our graduates have successfully moved into jobs in related fields, and others have even gone on to study in additional academic programs, such as law and education.

Biology

Carleton College

Biology is the study of organic life, from the structure and function of biomolecules through the complex evolutionary and regulatory processes of cells, organisms, populations, communities, and ecosystems. Biology students must be comfortable considering the fundamental concepts that weave through these levels of organization. In addition, our students should have the depth and breadth of knowledge to facilitate an integrative understanding of the interconnectedness and unity that make biology a cohesive discipline.

The Carleton College Biology Department has outlined the learning goals for Biology students in two parts that roughly represent differences in learning stages and pedagogical approaches. First, we stress the acquisition of areas of knowledge and the integration of fundamental concepts. These goals are achieved by the core course requirements at the 100 and 200 levels. Second, we emphasize skills of inquiry, analysis, and process in science. Opportunities for these higher learning goals are offered in the investigative labs associated with the majority of our courses, seminars that are based on primary literature, off-campus programs, and faculty-guided laboratory or field research. Though our laboratory courses and off-campus programs offer good research experiences, we encourage students interested in graduate school to gain additional research opportunities during the summer either at Carleton or another institution. Finally, the Senior Integrative Exercise ("comps") requires each student to research a specific question using recent primary literature. This affords the student an opportunity to work one-on-one with a faculty member, pull together their knowledge from their coursework, and write a concise review article that synthesizes relevant information regarding a particular biological question. Each student then gives a public presentation of his or her research, followed by an oral examination by two faculty readers. The experience is intense and, according to feedback from our graduates, prepares our students for the high expectations of graduate school seminars and exams. It is our goal to provide our students with the tools to be life-long learners in the explosively growing field of biology.

Minnesota State University Moorhead

The Minnesota State University Moorhead Biosciences Department has a tradition of preparing broadly educated graduates who are highly competitive for post-graduate educational opportunities and careers. Our faculty pride themselves in offering students excellent classroom experiences and incorporating research throughout the curriculum. We also have a strong tradition of providing students with opportunities to become involved in mentored research projects outside of the classroom.

The department offers a Bachelor of Arts degree in Biology and Bachelor of Science degrees in Life Science (Teaching) and Medical Technology. In addition to the B.A. in Biology, two emphases are available for students majoring in Biology: a Health and Medical Sciences Emphasis that may be appropriate for prospective health professionals in a variety of fields, and an Ecology and Evolutionary Biology Emphasis that may be appropriate for students interested in natural resources, ecology, and evolution. Biosciences faculty advise students in a number of pre-professional areas such as premedicine, pre-optometry, pre-veterinary medicine, pre-physical and occupational therapy, pre-physician's assistant, pre-wildlife management, pre-chiropractic, pre-mortuary science, pre-respiratory care and preforestry. Minors in Biology, Botany, Health and Medical Sciences, and Zoology are designed to support other fields of study such as art, psychology, education, chemistry and certain business majors. Teaching licensure is available in Life Sciences (grades 9-12). This licensure meets the requirements for licensure in Science (grades 5-8).

Graduates from each of our programs will understand fundamental biological concepts at the molecular, cellular, organismal, and ecosystem levels and recognize evolution as a unifying theme across biological disciplines. Gaining biological knowledge is not the only expectation we have for our graduates. We also expect our graduates to 1) demonstrate competence in general lab and field skills and be introduced to discipline-specific skills and their professional applications, 2) apply critical thinking skills and quantitative tools to evaluate biological information, 3) practice effective oral and written communication of scientific ideas in the manner of professional biologists, 4) acquire basic research skills in introductory courses and refine these skills in advanced courses including independent research, and 5) recognize the value of multicultural and ethical perspectives in the advancement and application of science in human society.

North Hennepin Community College

North Hennepin Community College has been a leading provider of higher education in the northwest metropolitan area since 1966. The college has experienced significant growth in the last decade and currently serves more than 16,000 students, including 4,300 students from groups traditionally underrepresented in higher education. North Hennepin Community College provides students with a variety of credit and non-credit offerings – including associate degrees and certificates in liberal arts and career programs as well as a number of baccalaureate and master's degrees through university partnerships.

The Associate of Science (A.S) in Biology degree is intended for students whose primary goal is to complete the credentials for a specific career and/or prepare for transfer to complete a bachelor's degree at a college or university who North Hennepin Community College has an articulation agreement. The A.S. degree provides a balance of general education courses and the required scientific, professional or technical courses in the degree program. General competencies of the A.S. Biology degree include the ability to understand and discuss the major principles of biology; demonstrate fundamental laboratory techniques, demonstrate scientific writing, presentations, and biological research methods; and succeed in upper division courses in biology at baccalaureate colleges and universities. This program allows students to take all of the required biology courses and many general education courses to allow them to transfer to a four-year institution with a junior standing in

the sciences. This program prepares graduates to work as a biology lab assistant or to continue on to obtain the bachelors degree in biology or related biological science field.

University of Minnesota

Majors in the College of Biological Sciences at the University of Minnesota learn biology by doing biology. Each of the seven majors we offer lead to deep understanding of a particular area of biology (genetics, biochemistry, ecology/evolution/behavior, microbiology, neuroscience, plant biology, and integrative biology). But we expect more! We emphasize learning how to apply that knowledge of biology to solve real-world problems. Our curriculum helps you gain the skills you need to meet your goals for life after college, including skills in critical thinking, problem solving, team-work, communication, data analysis, skills in finding and evaluating scientific information, and creativity. Most of our students plan to attend graduate school or professional school (medical school, dental school, pharmacy, veterinary medicine, etc.) after they graduate. Our emphasis on these skills provides a very strong foundation for your advanced education, but also for jobs in a variety of biology-related fields including biotechnology, teaching, research, and forensics. In addition, the education you will receive in CBS provide skills for non-science careers. For example, some of our graduates into public service, from being a science advisor to elected officials to working with the Peace Corps.

- *What lessons were drawn from this exercise?*

Comments from all campuses are grouped together:

Each institution has integrated related skills and competencies into their expectations of their graduates that are not necessarily specific to the field. Some of these areas are reflected in the Tuning General Competencies, but overall, these competencies were more broadly related than the outcomes present in the statements reported by each institution.

We learned several lessons from this exercise. The first lesson is that a "tuned" curriculum is an important and valuable goal – precisely because participating institutions are already tuned and quickly achieved consensus on learning outcomes for the biological sciences. The second lesson is that there is more work to be done on harmonizing student transfers among institutions and thus, we have taken the initiative to create a state-wide entity to formalize these discussions with MN institutions that did not partake in the Tuning process. Moreover, there is clear potential for this state-level initiative to expand to regional tri-state or Midwest areas, and eventually a national purview. A third lesson is to more critically parse the phrase "biological education" to appreciate that a professional biologist requires skills taught outside of the biological curriculum. Indeed, a Tuned curriculum requires skills in quantitative reasoning, communication, and critical thinking. A fourth consideration for a potential national qualifications network is to bear in mind that an important goal of an educated biologist is to participate in an informed democracy. Thus, educational goals in biological skill sets must be balanced against educational responsibilities of developing graduates capable of critical thinking and civic engagement.

- *What challenges did this exercise present?*

Comments from all campuses are grouped together:

Most graduating undergraduates from the University of Minnesota and Carleton College graduates and some of MSUM graduates go on to professional or graduate school, rather than directly to jobs.

Among the public institutions engaged in our project, approximately half of the students in the junior or senior year of a bachelor's degree program are transfer students, meaning their bachelor's degree comprises courses from two or more institutions. From the experience of the community colleges involved in this study, students in their programs are already taking courses at multiple institutions. Taken together, a majority of students are fulfilling their degree requirements at multiple institutions.

Historically, degree offerings, course offerings and course learning outcomes are developed with a mindset that students will start and complete a degree at one institution and be employed in the service area. There is more work to be done in harmonizing student transfers among institutions and thus, we have taken the initiative to create a statewide entity to formalize these discussions with MN institutions that did not partake in the Tuning process. Moreover, there is clear potential for this state-level initiative to expand to regional tri-state or Midwest areas, and eventually a national purview.
The biology team said:

The main challenges were logistical. Time allotted for this process was constrained, as indicated above. Although faculty possess expertise in their respective fields they are not necessarily expert in the process of implementing surveys. Future considerations will have to devote more attention to the increasingly nomadic nature of the modern student who spreads their educational experience over time and across multiple institutions.

8. A single-page (or less) summary of the merit each state sees in developing a national Qualifications Framework.

The development of a Qualifications Framework would have two broad benefits. First, the *outcome* would be a system that is more seamless and transparent to the student (and employer). Students would have a clearer understanding of the knowledge and skills that they will be expected to demonstrate and greater assurance that the core knowledge and skills are similar across a range of institutions.

Second, the *process* that faculty would use in developing the maintaining the framework would bring a range of faculty together to engage in serious and rewarding conversations about their discipline and about teaching and learning. Both the process and the outcome would have great merit.

Comments from the Teams:
This exercise was very enlightening to our team members because it demonstrated to us that at least among the four institutions we represent, we already had broad consensus on learning objective for biological education thus, our curriculum is already "tuned". Our courses and curricula have changed over the past decade to match the national science education reform agendas. Faculty and administrators who keep up professionally with the national trends have been able to incorporate these changes into their programs. Thus, an ad hoc "national framework" already exists and is reinforced by numerous professional societies and federal granting agencies.

Perhaps instead of a National Qualifications Framework, encouragement and support could be provided for local 2 and 4-year colleges and universities to recruit and maintain regional advisory boards to facilitate discussions about undergraduate biology competencies, curricula, and specific biology programs. Conducting surveys akin to the Tuning survey would be an important first step for such groups to identify and prioritize topics that need to be addressed. There could then be a national agenda that encourages consistency in general content and approaches to teaching and learning biology, with local and regional input as to the desired skills that employers and students seek in graduates of more specific programs geared towards particular jobs.

Attachment A

Minnesota Tuning Project Members

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Attachment B: Meeting Minutes and Agendas

Biology Tuning Agenda

Friday, October 2, 2009
10:00 a.m. – 2 PM.
64 Bioscience Center, St. Paul Campus, University of Minnesota
1445 Gortner Avenue, St. Paul, MN 55108
Robin Wright phone: 612-624-2244

Participants

Craig Longtime - North Hennepin Community College
Jonathan Shaver - North Hennepin Community College
Susan Singer – Carleton
Brian Wisenden – Minnesota State University Moorhead
Robin Wright – University of Minnesota
Alison Wallace – Minnesota State University Moorhead
Cheryl Maplethorpe – Office of Higher Education
Leslie Mercer – Minnesota System of College and Universities
Mark Wallert – Minnesota State University Moorhead
Michelle Malott – Minnesota State University Moorhead

Marcus Kolb will visit from Lumina Foundation

A G E N D A

10:00 a.m.	Call to Order	Robin Wright
10:01 a.m.	Review current status of survey	Cheryl Maplethorpe
10:30 a.m.	Review student curriculum and requirements for degree levels	Alison Wallace
11:45	Break	
12:00 p.m.	Review report requirements	Cheryl Maplethorpe
12:45 p.m.	Make writing assignments	Alison Wallace
1:00 p.m.	Lunch at Muffuletta's, 2260 Como Avenue West, St. Paul And continued discussion	
2:00 p.m.	Adjourn	

Biology Tuning Agenda

Friday, November 13, 2009

9:00 a.m. – 3:30 PM.

Carleton Alumni Center, Carleton College, Northfield, MN

Participants

Robin Wright _University of Minnesota
Alison Wallace – Minnesota State University Moorhead
Brian Wisenden - Minnesota State University Moorhead
Mark Wallert - Minnesota State University Moorhead
Craig Longtine – North Hennepin Community College
Jonathan Shaver - North Hennepin Community College
Susan Singer – Carleton College
Cheryl Maplethorpe – Office of Higher Education
Leslie Mercer – Minnesota System of College and Universities

A G E N D A

9:00 a.m.	Call to Order	Alison Wallace
9:01 a.m.	Review of survey report	Cheryl Maplethorpe
9:30 a.m.	Review student curriculum and requirements for degree levels	Alison Wallace
10:30	Break	
10:45 a.m.	Review report completion progress	Cheryl Maplethorpe
12:00	Lunch at Chapatis	Susan Signer leads the way
1:30 a.m.	Continue talk about final report	Alison Wallace
2:30 p.m.	Discussion about Biology conference on May 21, 2010 at the UM-TC	
3:30 p.m.	Adjourn	

Biology Tuning Agenda

Friday, October 23, 2009
9:00 a.m. – 3:30 PM.
McNeal Hall Space Lab, room 133, St. Paul Campus, University of Minnesota
1985 Buford Ave, St. Paul, MN 55108
Kate Maple phone: 612-624-9764

Participants

Myron Sahlberg – Alexandria TC
Craig Bjerke - Alexandria TC
Paul Johnson – Alexandria TC
Gale Bigbee – South Central College
Neil Nurre - South Central College
Kevin McLaughlin - South Central College
Kate Maple – University of Minnesota
James Boyd-Brent - University of Minnesota
Brad Hokenson - University of Minnesota
Bonnie Higgins – Bemidji State University
Barb Hanus - Bemidji State University
Andrew Graham - Bemidji State University
Cheryl Maplethorpe – Office of Higher Education
Leslie Mercer – Minnesota System of College and Universities

A G E N D A

9:00 a.m.	Call to Order	Kate Maple
9:01 a.m.	Review current status of survey	Cheryl Maplethorpe
9:30 a.m.	Review student curriculum and requirements for degree levels	Kate Maple
10:30	Break	
10:45 a.m.	Review report requirements	Cheryl Maplethorpe
11:15	Tour of Graphic Design labs	Kate Maple
12:00 a.m.	walk to restaurant	Lunch at Mim's Cafe, 1435 N. Cleveland Ave.
1:30 p.m.	Review writing assignments	Kate maple
3:30 p.m.	Adjourn	

Attachment C: Biology Tuning Report

4. A clear expression of learning outcomes by subject area and level for each discipline, both in terms of a.) subject-specific outcomes and b.) in terms of transferable skills/general competencies.

NOTE: To the extent possible, please clearly separate the transferable skills or general competencies by degree level.

During our first team meeting, we quickly came to consensus about what the biology competencies should be (see below). At subsequent team meetings, we discussed how these competencies are addressed at different levels. We agreed that after each of institutions transformed their introductory courses in response to the national science education reform initiatives (as explained above), we all strove for the same biological

Competencies at all degree levels. The only exception is #36: "Possesses and in-depth knowledge in at least one subfield of biology". Students will not be able to do this until they have taken a number of more specialized, upper-level courses.

We also agreed that the content used to address each competency varies from institution to institution depending on varying student populations, availability of equipment and facilities, and research opportunities. Competency #42 provides an example of this. One institution may have the equipment to be able to do an inquiry-based lab on DNA barcoding from start to finish, while another institution lacking the appropriate equipment may resort to doing a simulation by accessing information on the Internet.

a) Subject-specific outcomes

35. Possesses broad knowledge that integrates biology from molecular to ecosystem levels of complexity

36. Possesses an in-depth knowledge in at least one subfield of biology (e.g., biochemistry or ecology)

37. Recognizes evolution as a unifying theme across biology

38. Makes connections between biology and physical sciences, math, engineering, and computer science

39. Frames creative biological questions

40. Designs and conducts experiments that apply scientific approaches and methods

41. Accesses, uses and evaluates sources of information in biology, including published literature and scientific databases

42. Works effectively with computers and scientific instrumentation to acquire and analyze experimental data

43. Develops numerical, statistical, and graphical models to represent and simulate biological mechanisms

44. Visually communicates data and concepts in oral, written, and poster presentations

45. Considers biological problems in their historical, social, and ethical context

46. Recognizes the contributions of diverse cultures and individuals to biology

47. Practices professional and ethical standards in biology and its applications

These general competencies were identified by Tuning USA.

b) General competencies

1. Ability to undertake research at an appropriate level
2. Ability to work in an international context
3. Ability to communicate in a second language
4. Ability to act on the basis of ethical reasoning
5. Interpersonal and interaction skills
6. Ability to be critical and self-critical
7. Ability to search for, process and analyze information from a variety of sources
8. Ability to communicate both orally and through the written word in native language
9. Ability to design and manage projects
10. Determination and perseverance in the tasks given and responsibilities taken
11. Ability to adapt to and act in new situations
12. Ability to act with social responsibility and civic awareness
13. Ability to motivate people and move toward common goals
14. Ability to identify, pose and resolve problems
15. Spirit of enterprise, ability to take initiative
16. Ability to apply knowledge in practical situations
17. Skills in the use of information and communications technologies
18. Ability to communicate with non-experts of one's field
19. Commitment to safety
20. Ability to show awareness of equal opportunities and gender issues
21. Capacity to learn and stay up-to-date with learning
22. Capacity to generate new ideas (creativity)
23. Ability to evaluate and maintain the quality of work produced
24. Ability to work in a team
25. Commitment to the conservation of the environment
26. Knowledge and understanding of the subject area and understanding of the profession
27. Ability for abstract thinking, analysis and synthesis
28. Ability to work autonomously
29. Ability to make reasoned decisions
30. Ability to plan and manage time
31. Appreciation of and respect for diversity and multiculturality

Separating the above competencies by degree level could be done if each one is introduced at the two-year level and reinforced and applied in the upper level courses at the four-year level, and the progression by students is viewed as a spectrum. Articulating specific points along the spectrum would require additional discussion by members of the Tuning group, and the involvement of additional two and four-year institutions.

5.) Map of subject-area degrees to employment fields or professions, with explanations of how potential jobs for graduates were identified.

Undergraduate curriculum development for Biology programs simultaneously balance several pedagogical goals: (1) General education: The first goal is to prepare a thoughtful citizenry capable of creative and critical thinking. These general skills mark an educated person and are valued by all employers; (2) Effective oral and written communication skills. All employers require good communication skills; (3) Quantitative reasoning skills in terms of data management, experimental design, hypothesis testing and conclusions drawn from statistical inference, and the ability to use and critically assess quantitative argument; (4) Discipline-specific knowledge and skills that can be applied as a functioning biologist in today's and tomorrow's workplace. Increasingly, this is achieved by investigative, hypothesis-driven laboratory exercises. Because "Biology" is diverse, specific skill sets vary widely among specific subareas. Consequently discipline-specific curriculum consumes the entire curriculum after the initial core course in introductory biology. For example, concepts and skills in Biochemistry and Biotechnology emphasize skills in macromolecule manipulation particularly in the areas of nucleic acids and proteins, experimental design, attention to details in maintaining notebooks, and organization because these skills are those demanded by the workplace. In contrast, concepts in skills in Environmental and Resource Management emphasize skills in statistics and quantitative biology, experimental design, evolutionary biology, taxonomic identification of regional flora and fauna, fieldwork and concepts in population and conservation biology.

At some institutions, specialized majors have been developed for students desiring specific careers. We will provide one such example of this by describing the biology majors offered at Minnesota State University Moorhead. Over the past decade, Biology subjects were mapped by recognizing four general subareas within the field of Biology. The first area is a non-specific, broad foundation in the biological sciences. This skill set prepares students for entry positions as technicians in a variety of fields. The second area is in Health and Medical Sciences. This is the area of greatest enrollment because many students see this area as a path to a high-paying job, and for many, it is the only kind of biology they are familiar with when shopping for a college program. A third area is Biochemistry and Biotechnology, with obvious ties to Bio-business industries relating to medical and agricultural products and services. The fourth area is Ecology and Environmental Science with employment opportunities in agencies responsible for Natural Resource Management and Conservation Biology.

Conversations with industry leaders by members of the Tuning group identified skill areas that could be strengthened for undergraduates preparing for careers in industry. In the area of soft skills, examples were given regarding oral and written

communication skills, group work and conflict resolution, and understanding of regulated environments. Two specific examples from the area of oral and written communications are: 1) Industry leaders praised new employees' ability to make quality formal presentations in PowerPoint format but were concerned that students did less well in oral presentations where they were asked to describe their projects in one to two minutes; and 2) Employers praised new students ' ability to write formal laboratory reports or papers, but voiced frustration about the inability of new graduates to write short (one paragraph to two pages) effective summaries of their work for either general or scientific audiences. In technical areas specific to the Biochemistry and Biotechnology industry, one of the major skill sets of interest was an ability to work and design projects with professionals in other scientific disciplines. Thus, graduates should have an interdisciplinary background in biology, chemistry, physics, and have well-developed skills in quantitative reasoning and in oral and written communication that will allow them to function in a group and in a laboratory composed of biochemists, chemical engineers, physiologists, molecular biologists, and statisticians.

The general consensus appeared to be that undergraduates in the biosciences are prepared to enter the workforce in most technical areas but, modifications could be made to curricula in general that would improve preparation for working in a structured industry environment. Indeed, competency to function as a professional biologist requires skill sets typically taught in non-STEM departments. Therefore one of the outcomes of the Tuning process is the importance of a traditional Liberal Arts education.

Another important educational goal at the undergraduate level, especially for programs that concentrate on specific subareas of biology, is to prepare students for advanced study at professional and graduate schools. Typically faculty-mentored research experience is required. The Tuning process did not incorporate communication with graduate school programs, however this would be a useful exercise in future efforts.

Attachment D: Graphic Design Tuning Report

4. A clear expression of learning outcomes by subject area and level for each discipline, both in terms of a.) subject-specific outcomes and b.) in terms of transferable skills/general competencies.

Introduction

Graphic design is a relatively new field of study, having developed from commercial art, illustration, and the printing industry. Programs of study in graphic design are present in most institutions of higher education in Minnesota and the consistent mode of evaluation of student progress is a portfolio of student work. Graphic design education is studio based with a vocational goal; most graduates are training for employment in the field of graphic design. Programs participating in the Tuning project offer degrees ranging from associates degrees to doctorates. Most graduates do not seek graduate study in the field and most of the effort of this project concerned coordination among undergraduate degrees to better enable transfer and progression between two and four year programs.

Central to the efforts of those participating was a commonality of interest among participants in the advancement of design education in the State of Minnesota and elsewhere. The participants found a strong set of shared beliefs, interests, and concerns in spite of our disparate educational settings.

Project history and methodology

Participating Minnesota institutions were selected by the Minnesota Office of Higher Education as the grant recipient. Individual graphic design educators were solicited from program faculty in each institution and were convened for the first time in Chicago at a meeting sponsored by the Lumina Foundation. Graphic design as a discipline had not previously been "tuned", i.e. the Bologna/Tuning process had not previously addressed educational programs in graphic design. Graphic design was a divergent choice for Tuning as it has such a large technical component.

Many of the graphic design Tuning team had not met before and while some members were familiar with each other programs, many were not. Just the act of bringing graphic design faculty from programs/institution with such different missions and philosophies was unprecedented and may be the most substantial result of the project.

Tasks outlined by the funding organization were not well explained, and specifically not mapped to the field of graphic design. A timeline for the Tuning effort was presented that was short and challenging. Extensive information was presented by the funders on how the process had worked elsewhere.

Among the information encountered at the meeting was the concept of a 'discipline meeting' [derived from Utah history educators who were involved in the Chicago meeting as well] that formed the center of the process with which to move graphic design forward. Among graphic design educators there was agreement that meeting and sharing information about the various programs was of value. As the pedagogical emphasis of graphic design is on active learning in a studio environment, so too was the process that developed among the graphic design team. [In other terms, the epistemology of graphic design shaped the process of tuning graphic design. The way we think directed the way we worked.]

The graphic design Tuning team agreed to an ongoing set of meetings with a sequence of meetings at each participant institution. The agenda generally consisted of the following:

- An overview of the school's mission, philosophy, and academic programs.
- A tour of facilities and review of student work
- A discussion addressing the subject area, required competencies, and perceived and real differences among the programs.
- Any Tuning business related to the project
- A review of institution based surveys of employers and graduates

Because of the nature of graphic design, participating faculty were well acquainted with industry/professional needs. All the programs have relationships with the professional community, locally, regionally, and state-wide. Many programs use adjunct instructors from that community on an on-going basis. Internships, where required, also bring faculty and students in contact with professionals.

Student participation was modest; students were present for meetings throughout the process including the Chicago meeting, but no students continued through the entire project. Design work was presented by students at each campus visit, though; fruitful conversations about the nature of graphic design education ensued from these presentations. Students at most participating institutions were contacted as part of the Tuning survey.

Project futures

The graphic design Tuning group plans to continue to work together to advance graphic design education within Minnesota. Already programs have worked together on printing projects, student transferability, graduate admission, and intercollegiate faculty visits, with more efforts at the conceptual stage. Another significant effort of the group is a planned more inclusive discipline meeting, inviting all graphic design programs in the State to gather in St. Paul on April 30, 2010.

Project artifacts

Two artifacts were created through the discussions. The first, as derived from the charge from the Lumina Foundation, was the development of a survey based on previous surveys developed through Tuning efforts, and described elsewhere. The second artifact was a series of learning outcomes that seek to describe the results of graphic design education at two and four year conclusions.

The student learning outcomes were arrived at through ongoing group discussion. Starting each meeting with a review of the host's programs and a deeper look at student work helped guide the team and provided ongoing primary outcome examples. Spending time in the college facilities, reviewing current student work and discussing facility and equipment use was invaluable in developing a shared understanding of the importance of competencies needed for a successful graphic design program/graphic designer.

Student Learning Outcomes

These outcomes were developed through a collaborative effort of the graphic design faculty participating in Tuning. What may be the most striking finding of the project team is a common set of interests and concerns that spans 2-year and 4- year programs. These outcomes specific to the discipline are noted as Attachments. The points included were developed through extensive discussion of the participants at a very detailed level, but, in the end, the cited areas were supported by all.

Specifically the participants also sought to define how a graduate of a 2-year program differed from a graduate of a 4-year program, and to a lesser degree how a learner earning a masters degree would extend those same skills. Most of the differences between 2-year and 4-year programs appears through extended skill in solving more complex problems, addressing problems with more complex and rich solutions, and in the breadth afforded by the divergent classes available over a longer time span. In other words, while a 2-year program can provide much of the technical skill needed for professional practice, the intensely concentrated curriculum does not have curricular room for many other classes or learning experiences: there isn't enough time.

Similarly, a masters degree program allows a significantly richer and more in depth study of issues and ideas, and this would also shape expected student outcomes.

Programs in Minnesota do vary in length, quality, and composition, but graphic design, like other design fields retains a central tenant of studio education; the portfolio of work. Regardless of course titles and a common canon of work, the portfolio remains the lynchpin of transferability. In this collection of student work is demonstrated the capability of the student and the unique qualities of the educating institution.

Conclusion

Most designers view the design process as a means to seek success; the methods of the work include ideation, development and critique. In the Tuning Process, what was valued *was* the process, one of engagement, sharing, and discussion with colleagues in the discipline, and what should continue is the process of meeting and working with colleagues

Learning Outcomes:

DECLARATIVE KNOWLEDGE

Design as a Discipline. There is a specific way that you think as a designer that is outside the scientific and humanistic way of thinking. Students define themselves as designers but your interaction with designers may be different. Are you able to effectively associate with others and are you aware of a designers' way of thinking? Most designers are self-confident and independent. Characteristics of a designer are: passion to create; seeing as an artist sees; curiosity; imagination; dedication.

Design as a Business. Designers must understand project management; freelancing costs; pricing of time and materials. Internships are ways to gain this knowledge. 2-year students should have an internship as an option. 4-year students should have a mandatory internship. Other business considerations are relationship with employer and fellow employees and the marketing function of design.

Principles and Elements of Design. All designers must have knowledge of lines, shapes, color, value, space, rhythm, unity, balance, texture, emphasis, etc. as they pertain to design. This is crucial and the depth of understanding can be determined by whether they are a 2-year student or a 4-year student. For instance, a 2-year student should have knowledge of the RGB and CMYK color modes. A 4-year student should be able to explain why there are two modes.

Creative Process. Basic understanding of the creative process. In the beginning there are problems, restrictions and limitations. A good designer should research the problems, restrictions and limitations and develop a concept. The concept can be conveyed with sketches and comprehensive drawings. The designer then consults colleagues for reflection and feedback (constructive criticism). After feedback, comprehensives are made and the design is put into production-ready form. Then a presentation is made to the client.

Art Appreciation and Design History/Theory. A thorough understanding of art and design history and theory is needed by graphic designers. Art and design are strongly tied to historical, cultural and global concepts, trends, modes, and patterns within our society and profession.

Communication Solutions. Basic communication theories are a must. After all, design is a major form of communications. Hierarchy of information is conveyed through design and emphasis is used to denote importance.

Cultures. A general awareness of cultures is necessary for all designers. Other cultures as well as our own are changing daily and it affects current trends in design. The demographics that are needed by a designer are changing and a designer has to try to stay current. More and more we are changing to a global culture and it's changing the perspective of design. It used to be a designer could target a simple market and design to that market. The target market is getting more complex due to cultural changes.

PROCEDURAL KNOWLEDGE

Design Application

Through comprehensive curricula in design, students will:

Follow the design/creative process

- **Strategize.** Ask questions (who, what, why, when, where, and how) and fully understand the problem at hand. Develop an objective.
- **Research.** Develop a thorough and further understanding of the problem through interview, print and digital information.
- **Conceptualize.** Develop an idea to address the objective through mind mapping, word association, metaphors, and brainstorming.
- **Design.** Through small drawings (thumbnails), further refined design (roughs) and the final comprehensive design (comp), the student learns the process of transforming the concept into a physical solution that can be scrutinized and changed by the instructor (representing the art director, supervisor, manager, client) and enhanced as the final product.
- **Craft.** The physical handling of hardware and materials will enable the student to produce a professional outcome.

Use the principles and elements of design

- Along with the creative process, the principles and elements of design will be applied to create solutions/outcomes to various marketplace design problems.
- Principles of design include (and are not limited to) emphasis, unity, balance and rhythm. Elements of design include (and are not limited to) line, shape, color, value, space, and texture.

Select appropriate tools (and accompanying techniques) to meet intended outcomes

- The student must be able to use multiple tools—both digital and traditional. Digital tools include (and are not limited to) computer hardware (including drawing tablet), software, digital camera, flatbed scanner black/white printer, and color printer. Traditional tools include (and are not limited to) pencil, pen, marker, and brush.

Communication Solutions

Graphic design students must understand:

Communications Theory

- The designer will understand the process and different ways of transmitting information with regard to what is communicated, the audience to whom it is communicated, through what medium, and with what desired result.

The hierarchy of information

- The designer must be able to order information through design principles and elements.

Culture (Demographic, Psychographic):

- Demographic (gender, generation, location, social) and Psychographic (thoughts, feelings, beliefs, behaviors) information must be considered in the design process.

Drawing

Students need to:

- Acquire an understanding of the development of drawing in their life experience and culture.
- Document their drawing skills at the very beginning of formal training to establish an entry point for comparison and evaluation of their progress by themselves and those instructing them.
- Develop and understanding of how an artist sees the natural world in order to interpret that world on a surface with pencil or charcoal.
- Memorize, understand and apply the gestalt (the whole of drawing), which is made up of the knowledge and seeing of edges (soft and sharp, lost and found), shapes (positive and negative), relationships (sighting), values (light and shadow).
- Practice seeing and drawing edges, and evaluate.
- Practice seeing and drawing shapes, and evaluate.
- Practice seeing and drawing relationships, and evaluate.
- Practice seeing and drawing values, and evaluate.
- Practice seeing and drawing the whole, and evaluate.
- Discover that all drawing is the same, meaning that all subjects are approached the same way in basic drawing.
- Learn the process of drawing well enough to continue to improve their drawing skills and evaluate their progress throughout their life as an artist.
- Realize that knowing how to see and draw gives them the skills to see anything with a visual language and vocabulary. (If you have not drawn something you have not really seen it.)
- Every person should have a basic drawing skill, but an artist/designer in any area such as graphic design, architecture, illustration, furniture, and fashion should have a highly developed skill in drawing the world as we see it. Verbal skills alone cannot completely describe something we see. We need to be able to articulate the form and the light that falls on the form to understand the form.

In addition, students must develop skills in drawing in 3 dimensions, or 3 dimensional representation:

- Acquire a basic understanding of how to think and design three dimensionally.
- Acquire an ability to fabricate three dimensional form by experiencing in their coursework the conceptual problem of translating two dimensions into a three dimensional form (ranging from abstract formal exercises to specific graphic design packaging projects made by hand).
- Be able to convincingly render three dimensional form on a two dimensional surface: for example, to be able to rapidly sketch a three dimensional idea in order to visually communicate this idea to others.

Color Application

Students must:

- Acquire a straight forward and practical understanding of basic color theory represented on the color wheel, such as primary, secondary, tertiary, analogous, complementary, and triadic color harmony.
- Be familiar with color systems such as the Munsell Color System and people who have contributed to a greater understanding of color, including Josef Albers, Johannes Itten, M. E. Chevreul, and Sir Isaac Newton.
- Understand color terms and apply them – hue, value, temperature, and intensity.
- Understand the concept of subtractive color - mixing colors using paint, or through the printing process.
- Understand the concept of additive color - colors seen on the computer screen created with light
- Be able to distinguish and apply color modes such as RGB, CMYK, Lab Color, Bitmap, Indexed Color, Duotone, and Multichannel modes.
- Use Color theory to predict or specify color combinations that work well together or appear harmonious.
- Study color applications for design appeal.
- Research and apply color psychology as it relates to specific areas of use such as graphic design, sports, fashion, and automobile industry.
- Use the information about color from associations that are in the business of forecasting, researching, and archiving color such as the Color Association of the United States.

Typographical Application

To have a basic understanding and use of typography and its terms a student must understand and demonstrate competencies in:

- **Type classification**: Be able to identify modern, script, Gothic, casual, formal, informal,

etc. Have an awareness of history of lettering, printing and processes. Be able to draw fonts well enough for roughs and comps.

- **Use/Mixing**
  - Recognize font families
  - Choose fonts that properly convey idea or message
  - Mix different fonts that work well together without conflict
- **Craftsmanship**
  - Understanding concepts of weight, stroke, scaling and effects
  - Execute proper tracking, leading, kerning, formatting and alignment
  - Spelling, grammar, compositional details
  - Apply principles of contrast, repetition, alignment and proximity
- **Readability / Legibility**
  - Determine proper hierarchy for the copy
  - Consideration of the audience
  - Consider context: book, poster, signage, editorial, logo, etc.
- **Feeling and Meaning**
  - Font choice denotes meaning
  - Make appropriate color choices

Craft Skills

To have a basic understanding and facility with non-computer and computer skills the student must:

- **Understand and read measurements**
  - Be able to take measurements and read a ruler: inches, points, picas etc.
  - Be able to configure a computer to proper measurements
  - Be able to scale objects in proportion manually and with computer
- **Develop hand building skills**
  - Accurately measure, cut, glue, fold, assemble in a professional manner
  - Gain facility with many different techniques/materials
- **Develop computer craftmanship**
  - Proper measurements, orientation, bleeds, crops, folds etc.
  - Prepare files correctly: fonts, images, color space, pdf or native files

TECHNICAL KNOWLEDGE AND SKILLS

Software

Students must have a familiarity with all, proficiency in most, Expertise in a few software programs and systems.

- Adobe Creative Suites – InDesign, Photoshop, Illustrator, Bridge, Acrobat, Dreamweaver, Flash, etc.
- Presentation Software
- Office/Business Suite
- 3-D Software

The understanding and practice in use of various computer applications used to prepare digital visuals/files are imperative in the preparation of students for professional careers in art and design. Dependent on the major or specialization area, students must gain the following functional competence for various print and digital delivery/presentation methods:

2D Imagery

- Create and manipulate/edit bitmap, vector digital images for page/document assembly functions.
- Use of color correction methods and color management systems.
- manage various text and/or graphic file formats and importing/exporting files into various 2D digital imaging and page/document assembly applications.
- use of typography controls.
- manage cross-platform issues.
- manage digital production workflow.
- manage digital copyrights.
- use of document repurposing.
- use of various output/delivery method standards.

Digital Audio and Video

- use and control of various digital video standards as it relates to resolution, timing, color space and coding
- manage various DV and audio file formats and importing/exporting files into editing applications.
- use and control of various story structure techniques for a variety of project types, including short format projects, documentaries, and feature films
- create actual digital video footage for the editing process
- create soundtracks such as sound effects, ambiance, and music
- manage digital production workflow.
- manage digital copyrights.

Hardware

With the ever increasing incorporation of computer systems into the field of design the ability to use computer based hardware as well as several other key hardware devices has become vital for any graphic designer.

Students should develop knowledge of several types of hardware including:

- Knowledge of both Windows and Macintosh based hardware systems
- Knowledge of external hard-drives and flash drives
- Knowledge of printers including installation, calibration and maintenance
- Knowledge of scanners and scanning including the ability to scan both documents and film
- Knowledge of digital cameras
- General knowledge of both standard and high-definition digital camcorders
- General knowledge of lighting equipment for both still images and video
- General knowledge of audio hardware including microphones, mixers and speakers

Photography

Design is about image-making. Several factors contribute to the final image including elements such as typography, illustration and photography. Through the understanding of photographic and electronic processes and their relation to design, students can make decisions associated to the capture, manipulation and use of photography in design.

Through studies in photography, students will:

- Gain an understanding of digital photographic processes and materials
- Be able to utilize photography as a tool for visual research and as a medium for extending image-making
- Examine photography's ongoing relationship with graphic communication
- Become familiar with photo retouching, color correction**,** image enhancing, and image manipulation.

BROADER COMPETENCIES

Outside of the specific domain knowledge of graphic design are a set of broader academic and personal competencies that are developed through higher education.

Writing

Central to the practice of any profession is the use of written skills, and graphic design is no exception. Graphic design is, at its core, the creation of materials for communication, and communication generally involves significant amounts of writing. All graduates of graphic design programs should have an appropriate level of skill in writing which is generally achieved through coursework. Students in more advanced degrees should have progressively higher levels of writing skills and attendant capability to address complexity with clarity.

Writing skills are important: graphic design students should learn confidence in a variety of writing methods, and also learn to write in an audience-appropriate manner. Examples of types of writing that should be developed over the 2-year and 4-year programs are: creative writing (for idea generation), written analysis of projects and design work, writing to communicate with other designers (important in teamwork), writing to communicate formally with clients/professors (project descriptions).

Presentation

The ability to clearly and logically present design work or ideas in public is essential to graphic designers. It is anticipated that development of presentation skills will occur through common studio practices throughout all levels of study. Presentation skills are important. This includes being able to present one's own ideas and visual design, and also to be able to present other people's ideas (this is important in team work where the presenter might not be the actual designer, but needs to be able to enthusiastically articulate the concepts of the project).

The oral presentation of design work is an important skill for graphic designers. While much of the end products of graphic design are visually oriented, oral presentation and argument are needed to persuade clients, colleagues, and the public. Sternberg and Lubart (1999) describe this as the practical and contextual ability to be able to persuade others of the value of one's ideas.

Interviewing Skills

Students should learn how to express themselves verbally, with clarity, and demonstrating a clear understanding of the interview process: in both 2-year and 4-year programs, it is necessary to give students practice in developing this skill in in-class exercises.

Listening Skills

Essential to understanding problems, client needs, or communication is the ability to listen well. [Listening is used to include receptiveness to information gathered through observation, interaction, interviewing, and experience.] Communication and interaction are both based on responding to information gathered. Graphic designers must have developed skills that include the ability to gather, refine, analyze, synthesize and create with external information.

In the process of critiquing work, and engaging in class activities through the graphic design program, listening skills are developed. This is an important skill because it is tied to the idea of being receptive, and by extension, seeing beyond the limitations one's own point of view. Being receptive, gathering information, collecting data, and listening all help designers make informed design decisions, and bring flexibility and sophistication to a designer's professional practice.

Reading Skills

Basic reading skills are essential to any professional in today's world. More than the simple ability to decode the written word, skilled reading includes the ability to understand the larger thematic ideas included in any written work. While being able to quickly digest written information is important for designers, students similarly need to have acquired visual literacy skills and be able to read and evaluate visual information quickly and therefore be able to interpret meaning and intention in design.

Basic Math and Numeracy

Much of the work of the graphic designer is based on numerical relationships, and these must be understood through a fluency in basic math and awareness of the experimental methods of the sciences. Understanding should progress from the use of mathematical relationships in the direct work of the graphic designer [i.e. proportions, scaling, and manipulation of the work] through use of financial data to the analysis of quantitative information. "…needed for investigating the workings and development of modern society." (NASAD Standards)

Basic math and numeracy skills are important for graphic designers. Students should learn to solve design problems that need mathematical solutions, such as sizing problems, image resolution problems, technical aspects of the use of design software, etc. (some software, such as Flash, requires a stronger than basic math proficiency).

Confidence

During the 2-year and 4-year graphic design programs, students should be consistently encouraged to be confident and to express themselves confidently. Self-confidence can be engendered by developing and acquiring design skills and achieving excellence in work. It can also be taught through the critique process and through student presentations of work.

PERSONAL SKILLS

Personal skills are directly tied to the maturity and individual development of the student. In this area, we seek to identify (but not delimit) the qualities of the graduating student. Development at each level—at two, four, and six years, or at associate, bachelors, and masters degree—will be progressive and additive. For example, graduates of a bachelor's program should have a higher level of skill in writing than graduates of an associate's program.

While these skills are generally not well demonstrated in the portfolio of work of the typical graphic designer, they are generally critical to their professional and personal success. For example, with persistence, individual skills and knowledge can be developed over time by any learner.

Appearance

Students should learn what an appropriate professional appearance is—as professionals they will learn that how someone *looks* signifies how that person wishes to be seen by the world: so it is important that the inner intention and the outer appearance are in sync.

Independence and Interdependence

Students should learn teamwork skills—this is probably more appropriate for upper level courses in the 4-year program but should be initiated in the freshman years of both programs so that students get used to group learning and group production, and working outside of the comfort of what one already knows.

Students should learn to be very confident in working alone: what this requires is a strong sense of self-discipline, and an ability to generate ideas and productivity on one's own, without the weight of the team to help with this.

Responsibility and Accountability

By the end of the 2-year or 4-year program, design students need to have developed responsibility in a number of ways. At the simplest level, it includes attendance, meeting deadlines, and meeting agreed upon expectations, but it also extends to larger issues of professionalism and accountability.

A very important personal responsibility is the idea that you, the individual, are responsible for the work you do—that the well-being of your own self and others depends on your actions. One must make appropriate decisions regarding their behavior, one must recognize the consequences of their actions, and accept responsibility for personal errors.

Another aspect of responsibility that design students should take on is the idea of ethical responsibility in their professional practice. Students learn that images and text have the power to influence thinking, and students therefore should learn to take responsibility for not only their individual production but also for how that production is received. This implies also an awareness of other factors, such as cultural competence, that could inform this sense of ethics.

Inherent in responsibility is a meta-cognitive awareness of one's own self; recognizing strengths and weaknesses, limits and opportunities, and with an ability to evaluate one's own performance. At its heart, this leads to a central methodological tenet of design education, criticism.

Ability to Seek, Give, and Accept Constructive Criticism

Through in-class critiques and reviews, students should learn how to evaluate their own and others' work. Self-confidence plays into this: through developing self-confidence, students learn to take advantage of feedback and become adept at being receptive to criticism and understanding its value and importance in their academic and professional lives.

One of the defining features of design education is the use of active criticism in the educational process. Design education is problem based, and throughout the process, subjective opinions are used to guide design results. Designers should have the ability to seek, give, and accept constructive criticism, and subsequently be able to meta-cognitively self evaluate their own work. Inherent in this ability is the tendency to actively seek and solve problems, rather than being a passive respondent to design challenges.

Solve and Seek Problems

Students should learn to be both problem solvers as well as identifiers of problems. This latter skill is entrepreneurial in nature. It includes the increasingly important skill of being able to identify trends—and problems that may not have occurred but will. There is an ethical dimension to this skill: students should therefore learn current affairs and cultural competency. Students should develop an awareness of what is going on in the world during their 2-year and 4-year design education., so that they are “in tune” with their world and its strengths and problems when they graduate.

Resilience/Confidence in Abilities

Graduates must be able to recover from disappointment or bad experiences and still continue to work successfully. Self-confidence is an important personal trait.

Professionally and academically, it is also important for students to be confident in their growing expertise in design thinking and practice, and to express confidence in these skills. We all agree that design thinking has a special place in many areas of activity in the modern world —so it is important that on graduating from a 2-year or 4-year program students are aware of the value of their skills, and are able to effectively and persuasively articulate this.

Cultural Competence

Students need to be exposed to cultural issues throughout their 2-year and 4-year programs, and should develop an ability to empathize with cultural perspectives other than their own. By the end of the 2-year and 4-year programs students should have a broad personal feeling for and knowledge of history and of other cultural perspectives, as well as being aware of other geographical regions in the world. Graduates should have an appreciation for the diversity of ideas and cultures, and an ability to tolerate ambiguity.

References

The following were consulted in the development of the student learning outcomes:

National Association of Schools of Art and Design 2009-2010 handbook, retrieved from http://nasad.arts-acccred.org.

University of Minnesota Student Developmental Outcomes, retrieved from http://sdo.umn.edu

5. Map of subject-area degrees to employment fields or professions, with explanations of how potential jobs for graduates were identified.

Web designer, Graphic Designer (Begin as entry level designers, then can progress into lead designer or creative director): in-house design, advertising agency, design firm, exhibit design firm, Branding Firms, Marketing Firms, Interactive Agencies or Studios

Exhibit Designer: Design trade show exhibits, museums and educational exhibits, point-of-purchase displays and retail environments.

Potential jobs for graduates were identified by past graduate employment opportunities.

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Attachment E: Survey Report