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Introduction

The Alan Blizzard Award was created by the Society for Teaching and Learning in Higher Education (STLHE) to honour its former President, Alan Blizzard (1987-1995), on his retirement, for his significant contributions to the Society. Designed to recognize and stimulate collaborative efforts to strengthen and give greater visibility to effective university teaching and learning, the Award encourages and disseminates scholarship in outstanding collaborative teaching and learning. Each year, the project selected for the Alan Blizzard Award is presented by the team during a plenary session at the Society's annual conference. The monograph describing the project is circulated to all Canadian universities.

The concept for the Alan Blizzard Award was developed by a committee including Chris Knapper (President, 1982-1987), Alan Blizzard (President, 1987-1995), Pat Rogers (President, 1995-2000), and Dale Roy (Coordinator, 3M National Teaching Fellowships Program). The Award is sponsored by McGraw-Hill Ryerson's Higher Education Division. The Society is particularly grateful to Marlene Luscombe and Joe Saundercook of McGraw-Hill Ryerson, for their advice in the conceptual stages of the design of the Award and for McGraw-Hill Ryerson's ongoing support of this significant program through Patrick Ferrier, President of the Higher Education Division. McGraw-Hill Ryerson supports this Award as part of its focus on student learning and faculty teaching. For more information visit www.mcgrawhill.ca/highereducation/

This year, ten applications were received from eight Canadian universities. This monograph presents the 2008 Alan Blizzard Award submission, "Mech 2: A Collaboratively Designed and Delivered Program for Second-Year Mechanical Engineering." As a project in the Faculty of Applied Science, it is the team work of 14 members from five departments and two faculties at the University of British Columbia. Readers who are intrigued by the possibility of adapting this project to their own institutions are encouraged to contact the authors directly.

I thank Dr. Joy Mighty, STLHE President, Dr. Arshad Ahmad, STLHE Award Program Coordinator, Sylvia Riselay, STLHE Administrator, and the members of the 2008 Selection Committee: Alan Blizzard, Alex Fancy, Carol O'Neil, Dana Paramskas, and Pierre Zundel. Their time, attention, candid and careful deliberations honour and practice the ideal of collaboration informing the Alan Blizzard Award.

For more information and guidelines for submitting a nomination for the 2009 Alan Blizzard Award, visit the STLHE website at www.mcmaster.ca/stlhe/awards/alan.blizzard.award.html

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June 2008

Introduction

Le prix Alan Blizzard a été créé par la Société pour l'avancement de la pédagogie dans l'enseignement supérieur (SAPES) en l'honneur de son ancien président, Alan Blizzard (1987-1995), maintenant à la retraite, pour l'honorer de son immense contribution à la Société. Conçu pour reconnaître et stimuler le travail de collaboration qui a contribué à accroître le rayonnement et la visibilité de l'enseignement universitaire, le prix encourage et fait connaître la recherche en enseignement et en apprentissage. Chaque année, l'équipe de la SAPES présente le projet digne du prix Alan Blizzard durant une séance plénière de la conférence annuelle de la Société. La monographie décrivant le projet circule dans toutes les universités canadiennes.

Le concept du prix Alan Blizzard a été développé par un comité formé de Chris Knapper (président, 1982-1987), Alan Blizzard (président, 1987-1995), Pat Rogers (président, 1995-2000) et Dale Roy (coordonnateur, Programme de prix d'excellence en enseignement 3M). Le prix est financé par la Division de l'enseignement supérieur de McGraw-Hill Ryerson. La Société remercie Marlene Luscombe et Joe Saundercook, de McGraw-Hill Ryerson, pour leurs conseils dans les étapes de conception du prix. La Société remercie également McGraw-Hill Ryerson, par l'intermédiaire de Patrick Ferrier, président de la Division de l'enseignement supérieur, pour son soutien continu à cet important programme. McGraw-Hill Ryerson finance ce prix dans le cadre de l'appui apporté à l'apprentissage chez les étudiants et à l'enseignement du corps professoral. Pour obtenir plus de renseignements, visitez le www.mcgrawhill.ca/highereducation.

Cette année, nous avons reçu dix candidatures provenant de huit universités canadiennes. Ce document présente le projet gagnant du prix Alan Blizzard 2008, « Mech 2: A Collaboratively Designed and Delivered Program for Second-Year Mechanical Engineering ». Ce projet de la Faculté des sciences appliquées est le résultat du travail d'une équipe formée de quatorze personnes appartenant à cinq départements et à deux facultés de l'Université de la Colombie-Britannique. Nous encourageons les personnes qui sont intéressées à adapter ce projet dans leur propre établissement à communiquer directement avec les auteurs.

Je désire remercier Joy Mighty (Ph.D.), présidente de la SAPES, Arshad Ahmad (Ph.D.), coordonnateur du Programme de prix de la SAPES, Sylvia Riselay, administratrice de la SAPES, ainsi que les membres du comité de sélection 2008 : Alan Blizzard, Alex Fancy, Carol O'Neil, Dana Paramskas et Pierre Zundel. Le temps et l'attention qu'ils ont consacrés à ce travail ainsi que les délibérations attentives qu'ils ont eues à ce sujet témoignent de leur engagement envers l'idéal de collaboration prôné par le prix Alan Blizzard.

Pour obtenir plus de renseignements ou connaître la marche à suivre pour soumettre une candidature pour le prix Alan Blizzard 2009, visitez le site Web de la SAPES, à l'adresse www.mcmaster.ca/stlhe/awards/alan.blizzard.award.html

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Juin 2008

Mech 2—A Collaboratively Designed and Delivered Program for Second-Year Mechanical Engineering

From left to right—Warren Poole, Peter Ostafichuk, Joseph Yan, Steven Rogak, Tatiana Teslenko, Philip Loewen, Markus Fengler, Martin Davy, Sheldon Green, Gary Schajer, Antony Hodgson.

Missing—Elizabeth Croft, Brian Wetton, Michael Schoen.

Section A—Collaborating Team

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Dr. Sheldon Green	Professor and Department Head (MECH)
Dr. Antony Hodgson	Associate Professor (MECH)
Dr. Rachel Kuske*	Professor and Department Head (MATH)
Dr. Philip Loewen	Professor (MATH)
Dr. Warren Poole	Professor (MTRL)
Dr. Nimal Rajapakse*	Professor and Former Department Head (MECH)
Dr. Steven Rogak	Associate Professor (MECH)
Dr. Gary Schajer	Professor and Assistant Department Head, Teaching (MECH)
Mr. Michael Schoen	Sessional Lecturer (CPSD)
Dr. Tatiana Teslenko	Senior Instructor (CPSD)
Dr. Mary Wells*	Associate Professor (MTRL)
Dr. Brian Wetton	Professor (MATH)
Dr. Joseph Yan	Assistant Professor (EECE)

Collaborating members are from the University of British Columbia, affiliated as follows:

CPSD: Faculty of Applied Science, Centre for Professional Skills Development
EECE: Faculty of Applied Science, Electrical and Computer Engineering
MATH: Faculty of Science, Department of Mathematics
MECH: Faculty of Applied Science, Department of Mechanical Engineering
MTRL: Faculty of Applied Science, Department of Materials Engineering

*Drs. Frigaard, Kuske, Rajapakse, and Wells collaborated in the initial implementation of Mech 2 but are no longer directly involved with the program. Dr. Wells is now appointed at the University of Waterloo.

Section B—Nature and Features of Collaboration

The Mech 2 program at the University of British Columbia (UBC) is a complete, integrated, second year mechanical engineering undergraduate program that aims to develop the analytical, practical, and design skills of students. Mech 2 completely replaces a conventional course-based curriculum for the approximately 120 Second Year Mechanical Engineering students at UBC. It is delivered through four main courses in series which include thoughtfully integrated lectures, tutorials, labs, design projects, presentations, field trips and other activities. The integration and coordination take place within courses as well as across the entire program.

Mech 2 is taught by a team of fourteen instructors from five departments and two faculties. Instructors on the team collaborate to ensure logical and complementary timing of learning activities, and to reinforce connections in related course topics. Through the program, students also work closely with six technicians and a team of over 50 teaching assistants. Mech 2 is structured to ensure good communication within this team, and between the teaching team and the students. Weekly instructor meetings and annual program retreats allow for frequent exchange of information and in-depth discussions on program matters.

There has been a substantial increase in the teaching resources put towards the second year program with the hiring of an instructor to coordinate the program and an increase in the number of teaching assistants by almost 50% over the conventional program. The instructors in the program have been selected based on their commitment to teaching (evidenced by a large number of teaching awards among this group), and the teaching assistants in the program are also of excellent quality and have regularly been honoured with teaching awards.

Section C—Abstract

In 2004, the Mechanical Engineering Department at the University of British Columbia replaced its entire Second Year undergraduate curriculum with a new program called “Mech 2.” Mech 2 is a radical departure from a conventional curriculum as it completely integrates previous content from 15 disparate courses into four main courses taken in series. In a traditional engineering program, students take many diverse courses at the same time and spend a great deal of energy juggling disconnected assignments, projects and mid-term exams. A consequence of this system is that most students tend to compartmentalize information along course lines and they do not see the connections among related subjects. In addition, the timing of related material from different subjects and instructors is often left to chance. Likewise, opportunities for instructors to collaborate on the delivery of related content and draw connections between subjects are commonly lost.

The primary innovation of Mech 2 was to rearrange the content of the previous Second Year courses into an integrated curriculum. Within Mech 2, the material is coordinated to bring together related topics in a systematic and orderly sequence. Students take only one course at a time and teaching is done by a committed team of fourteen instructors collaborating from five departments and two faculties. The program is structured to ensure good communication within the teaching team of instructors, as well as between the team and students. Instructors teaching related topics cooperate to ensure optimal timing of the material as well as to emphasize and reinforce natural connections between subjects. The courses in Mech 2 also include many different learning activities such as classes, tutorials, labs, design projects, presentations, field trips, and so on; these activities are all carefully coordinated and integrated within the program. An additional objective of Mech 2 is to increase the amount and the effectiveness of “hands-on” and professional training which students receive.

Summative program surveys have shown students prefer Mech 2 to a conventional curriculum (70% positive response) and they perceive Mech 2 as being more effective at integrating subject matter from different domains (90% positive response). A statistical analysis of student performance has shown that students who have passed through Mech 2 do considerably better in Third and Fourth Year courses than students from the conventional program, and the Mech 2 students have higher average grades compared to non-Mech 2 students with the same First Year average. In addition, the percentage of Mech 2 students who fail core senior year courses has dropped by more than a factor of four compared to the previous curriculum.

Institutional Context

Prior to implementation of Mech 2 in September 2004, the Department of Mechanical Engineering at the University of British Columbia had a fairly conventional second year curriculum. Specifically, the second year consisted of courses in solid mechanics, rigid body dynamics, basic electrical circuits, ordinary differential equations, multi-variable calculus, thermodynamics, fluid mechanics, engineering design, materials science, technical communication, and associated labs. Students also received some limited instruction in machine shop practice and engineering software. These different subjects were all taught as separate courses; students would enrol in 15 courses in Second Year. Owing to bureaucratic and logistical challenges, not only were students taking many courses simultaneously, but the timing of the course offerings was almost completely uncoordinated. For example, students might be taught linear differential equations either long before (or worse, long after) it would be required to understand single degree of freedom vibrations.

The primary innovation of Mech 2 was to rearrange and revise the second year material into an integrated curriculum where all the material is coordinated to bring together related topics in a systematic and orderly sequence. A consequent innovation of Mech 2 was to reduce (from seven to one) the number of courses students take concurrently.

The implementation of the Mech 2 program required two years of planning and curriculum design, as well as a series of negotiations to bring in courses from other departments. As well, considerable time was spent designing and implementing new and revised laboratory experiments to support the curriculum. Considerable faculty time and monetary resources were committed to the project including:

- hiring a fully time instructor to coordinate Mech 2 and teach a portion of the curriculum
- providing a reduced teaching load for faculty preparing curriculum for, and teaching in, the Mech 2 program during its start-up period
- implementing a $CAD115,000 upgrade to laboratory space
- purchasing $CAD 148,000 in new laboratory equipment
- providing a room for drop-in tutoring and student study space
- Increasing the number of teaching assistantship hours in second year by 45%.

Currently, Mech 2 is taught by a team of 14 instructors from five departments and two faculties. Through the program, students also work closely with six technicians and are supported by over 50 teaching assistants. The faculty members participating in the Mech 2 program are considered to be some of the best teachers in the university. Three have won prestigious teaching awards and one has been nationally recognized for her support for women in engineering. All instructors feel that it is a privilege to be part of the program, and almost all have stayed with the program through its first four years.

Goals of the Project

The goal of Mech 2 is to give students a clear and unified understanding of fundamental mechanical engineering concepts and practices. The program is inter-disciplinary in nature, combining mathematics, physics, engineering science, engineering design and technical communication into a single learning context. The new curriculum emphasizes interactive learning, including multi-modal

dialogue and "hands-on" training. Personal interactions between students, instructors and teaching assistants are enhanced compared with traditional engineering instruction styles. Furthermore, the use of computer and web-based teaching technology (WebCT / Vista) to supplement content delivery and assessment is implemented to enhance learning outcomes. Mech 2 is designed to respond to the rapidly evolving and interdisciplinary nature of the Mechanical Engineering profession.

The design and delivery of Mech 2 draw from many effective practices in undergraduate education. In particular, Chickering and Gamson's (1987) seven principles for good practice in undergraduate education pervade the Mech 2 program:

- Strong contacts are encouraged between students and faculty.
- Cooperation and reciprocity are developed and encouraged among students.
- Active learning is utilized extensively in all aspects of the program.
- Feedback is prompt and regular.
- There is an emphasis for "time on task."
- High expectations are communicated from the first class and repeated regularly.
- Diverse talents and different ways of learning are respected.

Likewise, as suggested by Gillespie (1996), efforts are made to encourage student participation in classes, to provide a variety of experiences, to engage students with new technologies, and to obtain student feedback. The desired learning outcomes for students completing the Mech 2 program are as follows:

- Apply fundamental principles of Mechanical Engineering to real-world, multifaceted engineering problems.
- Develop lifelong learning skills.
- Communicate engineering concepts and designs to other engineers and to non-technical stakeholders.
- Work effectively in both membership and leadership roles in a team.

Along with achieving our key objectives, this program has had a number of ancillary benefits:

- Increasing personal contacts between faculty and students, through reduction of large format lecture time, and increase in small group activities mentored by faculty.
- Reducing repetition of material between courses. Many concepts, such as moments of inertia, conservation of mass, work and energy are utilized from course to course, but previously, students did not seem to transfer the knowledge.
- Producing a higher level of faculty satisfaction with the way we "teach", directly related to measurably better outcomes for our students.
- Increasing the cohesiveness of the faculty as a unit. This will likely infect our research as well, producing superior collaborations in research.
- On average, statistical analysis of Mech 2 versus non-Mech 2 cohorts shows that the Mech 2 students substantially outperform the non-Mech 2's in the same Third Year subjects (as presented in Section 0).

The members of the Department of Mechanical Engineering were very supportive of the proposal and the team putting together this program. Some difficulties did arise in bringing other departments and faculties on board, mainly related to concern about curriculum control and standards. Careful

negotiations took place which had the successful result of bringing excellent instructors from Electrical and Computer Engineering, Materials Engineering, Mathematics (which is housed in a different faculty), and the Centre for Professional Skills Development to participate in the development and delivery of the program curriculum. As a result of these efforts, Mech 2 is held up within the University as a model of interdepartmental and interfaculty cooperation.

The other major hurdle was the change to the student culture in Mechanical Engineering. Students initially found the change to an integrated program challenging due to their previous educational career in which they had always been able to manage knowledge through subject compartmentalization. The removal of these barriers was somewhat of a shock. Furthermore, due to this compartmentalization, the understanding of the past material was often somewhat shallow and could not support the level of learning which required integration of material. Finally, increased student anxiety was noted with the integrated exams which covered related material from multiple areas rather than single subject tests.

These issues were mainly addressed by the introduction of an entrance exam and review sessions within the first four weeks of the program. The exams help students to identify knowledge which they may not have adequately acquired prior to joining the program, and the review sessions help to consolidate student knowledge in these areas as well as to introduce ideas about integrating knowledge and taking on a broader, self-responsible approach to learning. Both the exam and the review session curriculum were developed and updated by the whole Mech 2 teaching team to address student learning obstacles recognized within the program.

Finally, one of the most useful activities implemented within the Mech 2 program is weekly instructor meetings and the yearly program retreat/review sessions; in a sense, the Mech 2 team has become its own learning community (Gillespie, 2001) through the exchange of information and in-depth discussions which take place. By maintaining close communications among the teaching team and through student surveys and discussion boards the instructors have the agility to respond quickly to learning issues that develop within the class. Comprehensive surveys of students are done throughout the year and evaluated and addressed at our program retreat such that the Mech 2 program is one that continues to improve, winning the ASME Curriculum Innovation Award in 2005 and the Alfred Scow Award for student development and learning in 2007.

Project Description

Mech 2 is delivered through four main courses presented in series rather than the conventional format of a large number of distinct courses presented in parallel. The courses are:

1. MECH 220 Engineering Skills Practicum
2. MECH 221 Engineering Science 1
3. MECH 222 Engineering Science 2
4. MECH 223 Engineering Design

The Mech 2 program and its component courses are structured to ensure good communication within a team of instructors who together cover all disciplines. Consequently, material in Mech 2 is presented in a logical and efficient manner. Physical experiments, computer labs, field trips, and other supplementary activities are all delivered according to a schedule that closely follows the organized sequence of the lectures.

The Mech 2 course sequence begins in the first semester with MECH 220, a four-week technical skills practicum. This practicum includes hands-on instruction in machining, computer-aided design (CAD), electronics, and drawing. The students next take MECH 221, a ten-week engineering science course in dynamics, solid mechanics, electrical circuits, materials engineering, and differential equations. After a two week university break, the second semester starts and students take the first part of a seven-week course in engineering design, MECH 223. This portion of MECH 223 has a design project focused on the material of MECH 221. MECH 222, a seven-week engineering science course in thermodynamics, fluid mechanics, and multi-variable calculus, follows the first part of MECH 223. Finally, the second part of MECH 223, with a focus on the design of a thermo-fluid system, closes the year. APSC 201, a course in technical communications, is separate from Mech 2 for accreditation reasons, but is otherwise fully integrated with the MECH 223 design course.

In a broad context, the hands-on emphasis of the Mech 2 program takes inspiration from the successful design-based practicum emphasis in the engineering program at Harvey Mudd (Bright and Philips, 1999, Dym et al., 2005). The design portion of Mech 2 has been inspired by the problem based learning (PBL) approach that characterises all education at the University of Aalborg (Kjersdam, 1994). A brief description of each of the four Mech 2 courses follows.

1. Engineering Practicum (MECH 220)

The first course in Mech 2 (MECH 220) is a practicum in which students complete four one-week modules in machine shop practice, instrumentation and electronics, CAD, and engineering drawing. The class is divided into four groups of 30, and each group rotates through each module. At the end of the four weeks, students have modeled, documented, fabricated and tested their own fully working, electronically controlled magnetic levitation device. Additional assembly time is allowed at the end of the practicum so that students can finalize their device and obtain the satisfaction of a completed electro-mechanical project.

A primary objective of this course is to develop students' hands-on skills in a variety of areas important to mechanical engineering as well as to develop skills and confidence that can be used later in other Mech 2 courses. Another objective of MECH 220 is to give students exposure to a typical mechanical engineering project in which concepts from disparate disciplines are integrated during the design process. The design process provides some insight to students who are still unsure of exactly what mechanical engineering involves. This start to Second Year contrasts with a conventional program, in which students continue to develop their theoretical understanding of engineering in second year prior to seeing practical applications.

2. Engineering Science 1 (MECH 221)

The second course (MECH 221) is ten weeks long and covers material in engineering science including rigid body dynamics, solid mechanics, materials engineering, electrical circuits, and differential equations. The dynamics and solid mechanics topics are delivered by instructors from the Mechanical Engineering Department. The materials engineering and electric circuits content is delivered by instructors from the Materials Engineering and Electrical and Computer Engineering Departments, respectively (both departments belong to the Applied Science Faculty along with Mechanical Engineering). The differential equations material is taught by an instructor from the Mathematics Department of the Faculty of Science. The math content is fully integrated into MECH 221 in delivery and assessment, but a separate course (MATH 256) appears on student transcripts for administrative purposes only.

MECH 221 uses a combination of lectures, tutorials, labs, computer labs, field trips, guest speakers, and question-answer sessions. Twelve lectures per week are the primary contact between students and instructors (see Burgan, 2006, for a discussion in support of lecturing); students also spend time in small groups with instructors in question-answer sessions. The tutorials, labs, and other events are integrated into the schedule so as to be coordinated with the lecture schedule and delivered in a timely manner. The variety of closely coordinated activities is intended to support all learning styles (Terry, 2001). Teaching assistants in Mech 2 come from the various departments and faculties (for example, a teaching assistant from the Math Department conducts the math tutorials). In addition, physical labs are conducted from all three engineering departments involved using those departments' facilities and personnel. Computer labs integrating math content with the engineering science content are conducted in Mechanical Engineering facilities using Math personnel.

The integrated nature of Mech 2, along with the team-based approach to teaching, allows instructors to minimize duplications in teaching while still emphasizing the natural connections in topics. For example, mass-spring-damper systems and RLC circuits are physical analogues and are taught at approximately the same time; the duality of these systems is highlighted and teaching efforts are coordinated by the respective instructors. Necessary background information (ordinary differential equations taught by the Math instructor, in this case) is also delivered to the students at an appropriate time. Consequently, the instructor schedules are not fixed but rather change from week-to-week to facilitate the flow of the material.

Following Chickering and Gamson's (1987) principles of good practice, students receive prompt feedback on their learning through weekly quizzes and online assignments throughout the course. At the end of MECH 221, students write three integrated final exams. At least two subjects appear in each exam, and at least some of the questions combine multiple topics and are jointly written by the instructors involved.

3. Engineering Design (MECH 223)

In the second semester, students begin an engineering design course (MECH 223). MECH 223 is divided into two parts: one that occurs at the start of the second term, after MECH 221, and one that occurs at the end of second term, immediately following a second engineering science course, MECH 222. The first part of MECH 223 combines the practical elements of MECH 220 with the engineering science of MECH 221 and it introduces students to a formal design process. MECH 223 is taught in a fully team-based learning approach (see Michaelson, Knight, & Fink, 2004) which helps foster a cooperative and collaborative environment (Chickering & Gamson, 1987).

The highlight of each part of MECH 223 is an intensive design project, common to the entire class. The projects are supported with lectures on design theory and technical communication, workshops on group dynamics and rapid visualization, and computer labs on CAD and material selection. Each design project concludes with collaborative team formal reports and oral presentations. These elements are supported by training in technical communications that continues through the entire second term.

Although the design projects create a natural focus for the MECH 223 course, there is also formal instruction in design through assignments and classes delivered in a team-based learning format. Six instructors (three from Mechanical Engineering, two from the Centre for Professional Skills

Development, and one from Materials Engineering) collaborate to deliver the lecture content. Similar to MATH 256 above, the technical communications content appears separately on students' transcripts (as APSC 201) for administrative purposes. Invited experts from industry and class discussions with "student experts" (see Renner, 1999) explore issues relating to the societal context of engineering.

Since a major emphasis of the MECH 223 course is on teamwork and team-based learning, a great deal of care is put into assigning students to their teams. Each team's members are carefully selected by the instructors, as suggested by Feichtner and Davis (1991) to ensure maximum heterogeneity (see Michaelsen et al., 2004, and Wright, 1994). In particular, the factors considered in group formation include parameters such as the Myers-Briggs personality type, grades in MECH 220 and MECH 221, communication and language ability, and so on. This heterogeneity ensures that each team benefits from a variety of different perspectives, skills and resources, and that the teams have equal opportunities for success in the projects. The same teams are used throughout the MECH 223 course. To assist students with functioning as a cohesive team, several workshops on group dynamics are included in the course. The sessions are led by an educational psychologist from UBC Career Services and they focus on highlighting differences in personality type and working style and on providing tools that teams can use for fostering group harmony and for dealing with interpersonal conflict.

MECH 223 concludes with two final examinations on design and one final examination on technical communication.

4. Engineering Science 2 (MECH 222)

The fourth course that Mech 2 students see (MECH 222) is an engineering science course on fluid mechanics, thermodynamics, and multi-variable calculus. The course is seven weeks in duration and has an almost identical structure to MECH 221. Content is delivered by two Mechanical Engineering instructors and one instructor from the Mathematics Department in the Faculty of Science. As with MECH 221, the math course appears separately on students' transcripts (as MATH 253) but is otherwise fully integrated into MECH 222 in delivery and assessment. At the end of MECH 222, students write two final exams which integrate material from the three topic areas. Following the end of MECH 222, students immediately begin the second portion of the MECH 223 design course but this time they complete a project requiring application of content from MECH 222.

Section E—Impact on Student Learning

Assessment of the effectiveness of Mech 2 in meeting the goals set out in Section D was done using direct feedback from students and by examining student performance in senior courses. The student feedback over the last two years is very positive with students identifying Mech 2 as being effective and preferable to a conventional program. Examination of student grades in Third and Fourth Year courses indicates that Mech 2 students academically outperform students who completed a conventional second year curriculum.

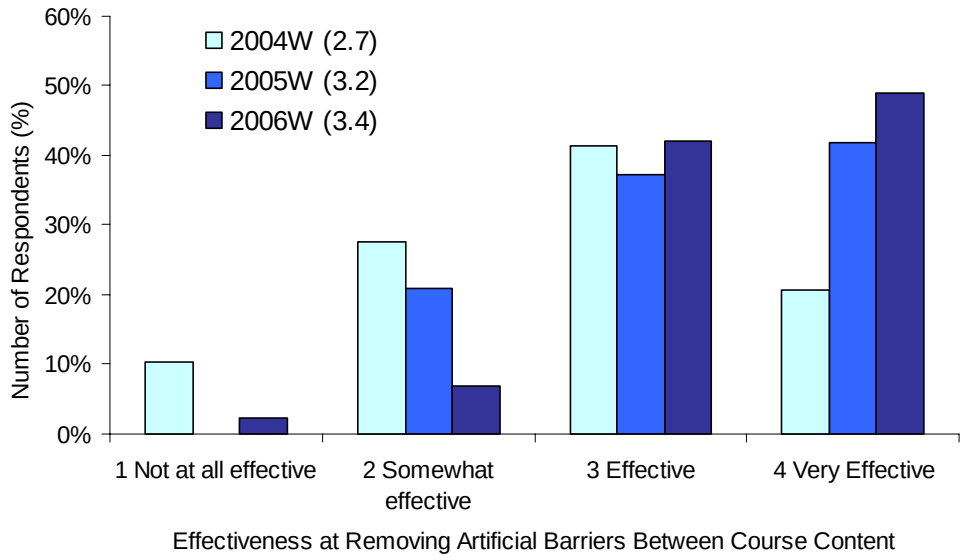
Student Survey Reponses

Weekly formative surveys have been used in Mech 2 to gauge student mood and address any arising issues early. Summative course surveys have been used at the end of each year in Mech 2 to obtain feedback and determine overall student opinion of the program. The online summative surveys were optional and anonymous and had response rates of 40 to 54%. The surveys included a selection of multiple choice and open-ended written questions. Quantitative results from two survey questions (effectiveness at removing artificial subject barriers, and preference to a conventional program) are provided below. A selection of additional qualitative responses from the surveys is provided in the supplementary material included with this award application package.

Mech 2 Effectiveness

In the surveys, students were asked "How effective do you feel Mech 2 was in removing artificial barriers between course content?" The responses were based on a four-point scale and are shown in the figure below:

Figure 1
Survey results showing student rating of Mech 2 effectiveness at removing artificial barriers between course subjects

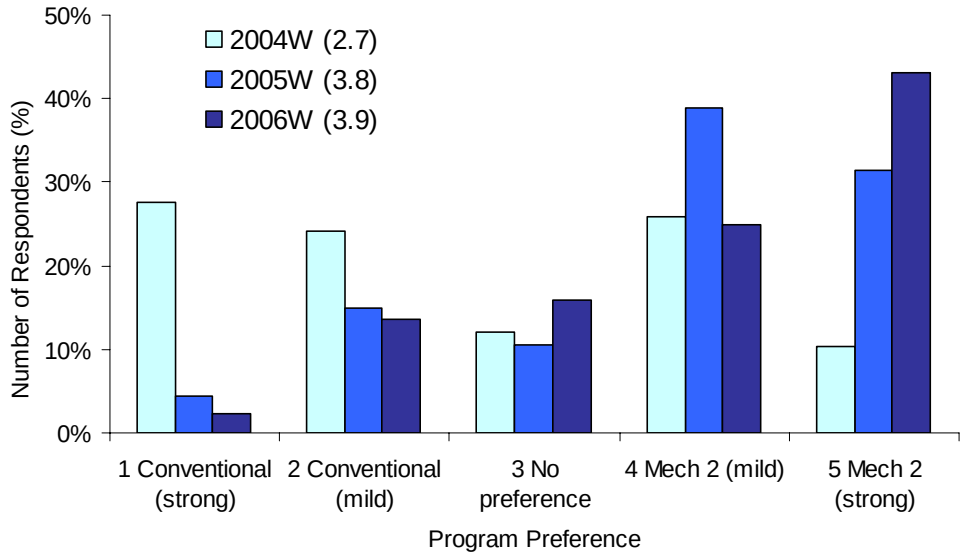


The weighted averages for the 2004W[1] to 2006W sessions were 2.7/4.0, 3.2/4.0, and 3.4/4.0 respectively. The number of students who rated Mech 2 as either effective or very effective in each year from 2004W to 2006W was 62%, 79%, and 91%. The 2005W and 2006W results in particular indicate a strong positive student perception of the effectiveness of the Mech 2 approach. In related survey questions in 2006W, Mech 2 was rated as being effective or very effective in developing practical ("hands-on") skills by 93% of students, and in developing professional skills (such as team-work, time management, and communication) by 98% of students.

Program Preference

The second key aspect considered from the summative surveys is the student preference for program format. Students were asked "Considering the material that you covered in Mech 2, if that were instead delivered in a conventional program which do you think you would prefer?" and they were given five answer choices ranging from strong preference for a conventional program to strong preference for Mech 2. The survey results are shown in the figure below.

Figure 2
Survey results showing student preference
for Mech 2 over a conventional-style program



The trends from the 2004W to 2006W cohorts were similar to those above. With an average response of 2.7/5.0, the 2004W cohort indicated a slight overall preference for a conventional program (36% of students preferred Mech 2). The 2005W and 2006W cohorts indicated a preference for Mech 2 with scores of 3.8/5.0 and 3.9/5.0 respectively. In total, 70% of the 2005W cohort and 68% of the 2006W cohort preferred Mech 2.

[1] The standard academic year at UBC starts in September, ends in April, and is denoted with a "W" for Winter Session. Thus, 2004W refers to the academic year from September 2004 to April 2005.

Performance in Senior Courses

The comprehensive nature of the changes in second year course structure, assessment techniques, instructors, and so on meant that there was no direct means (that is, no direct control group) to compare student performance in Second Year between Mech 2 and the conventional curriculum. Instead, performance in Third Year core Mechanical Engineering courses and one core Fourth Year course was used as a benchmark for comparison of the Second Year programs. The benchmark courses included Third Year engineering design, six subjects in engineering science (vibrations, solid mechanics, applied electronics, heat transfer, thermodynamics, and fluid mechanics) and a Fourth Year course in automatic control (MECH 466). The automatic control course was selected because it was one of the few courses taken by a majority of students at the Fourth Year level.

Three metrics were selected for assessing the effectiveness of Mech 2 in comparison to the previous conventional curriculum using the above benchmark courses:

1. Average course grades.
2. Change in course grades from first year.
3. Course failure rates.

Average Course Grades

As a result of differences in student timetables due to work experience terms (Co-operative education) and changes to the Third Year curriculum, there was one year when the same core Third Year engineering science courses were taken by some students from the 2004W cohort of Mech 2 and some students from the previous conventional curriculum. A comparison of the average grades in these courses is shown in the table below.

Table 1
Comparison of Third Year course grades for Mech 2 students and students from the previous conventional program

	Conventional		Mech 2		
	n	Average grade	n	Average grade	p
Engineering design courses*	76/6	75.8%/72.0%	4/76	83.8%/80.0%	- / -
Engineering science courses	77	64.7%	81	77.5%	< 0.001
MECH 466 course	100	69.1	23	75.4	0.072

* Due to changes in the Third Year course schedule, only a small number of Mech 2 and pre-Mech 2 students were in the same engineering design courses at the same time. Results from two separate years are shown for completeness; statistical comparison has been omitted.

The students from the 2004W Mech 2 cohort outperformed the non-Mech 2 students by an average of 12.8% in the engineering science courses and 6.3% in the MECH 466 automatic controls

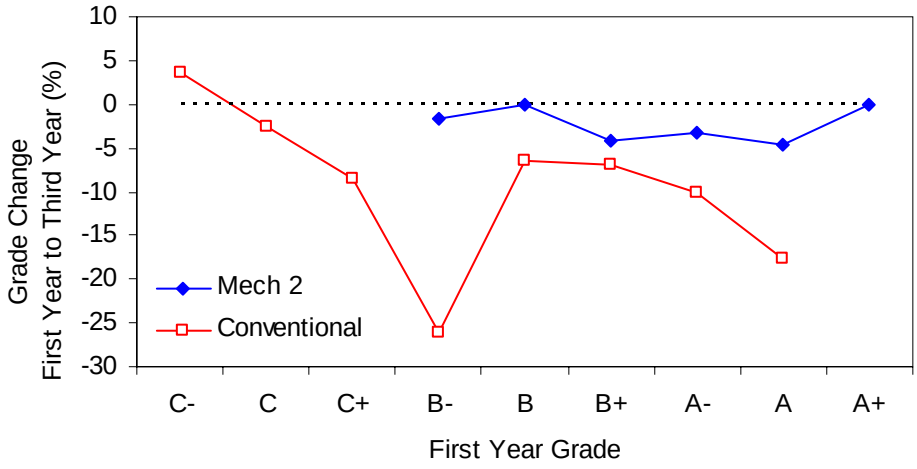
course. The significance of the difference in the average engineering science and MECH 466 course grades was determined using a two-tail T-test for the difference in means with normal distribution in grades assumed. One weakness with this analysis is that it does not take into account differences in the innate academic ability of the Mech 2 and non-Mech 2 students. For this reason, a further comparison of performance in the Third Year engineering science courses was made by considering the change in grades from First Year engineering.

Change in Course Grades from First Year

UBC Engineering students in all disciplines take a common First Year curriculum consisting of engineering science and math courses. In order to more fairly compare the 2004W Mech 2 cohort to the pre-Mech 2 students, the individual grade changes from First Year to the Third Year engineering science benchmark courses was tracked. Students were grouped into bins according to the letter grade associated with their First Year average. Only the engineering science courses were considered in the analysis as it was the only benchmark case with a significant number of students (57 Mech 2, 24 non-Mech 2) who completed First Year at UBC.

For each bin, the mean change from First Year average to Third Year engineering science average was computed. The results in the figure below show that for equivalent First Year performance, Mech 2 students outperform non-Mech 2 students for all First Year grade levels. The average grade change from First to Third year was -3.3% for Mech 2 students and -8.1% for non-Mech 2; in terms of the resulting letter grades, the Mech 2 students saw an average drop of 0.7 letter grades while the non-Mech 2 students dropped by over 1.6 letter grades.

Figure 3
Change of grade from first year to third year comparison for Mech 2 and conventional program



Course Failure Rates

The analysis above in terms of average course grades and the change in grades from First Year is based on the mixed Mech 2 / non-Mech 2 classes during one year. In order to expand the analysis to a larger group of students, historical data regarding course failure rates from before and after Mech 2 was

considered. "Failure rate" is used to describe the percentage of a class which did not achieve a passing mark in a given course and was required to repeat that course in the future; in the case of mixed Mech 2 / non-Mech 2 classes, the failure rates are defined with respect to the number of students belonging to the same second year curriculum. Course failure rate was used as it was believed to be less sensitive to changes in course structure, assessment methods, instructor, and so on than other metrics such as average course grade.

Historical data drawn over seven years from the benchmark courses was used to compare the Mech 2 cohort (two years of data) to students who passed through the conventional Second Year system (six years of data). The results are shown in the table below and clearly indicate that the Mech 2 students experience dramatically lower failure rates (more than a four-fold reduction) than their counterparts from the previous curriculum. The standard deviation in failure rates in a given course from year-to-year was quite consistent and ranged from 3.2% to 5.8% for the 69 courses considered with the non-Mech 2 students and 0.5% to 1.9% for the 20 courses with Mech 2 students.

Table 2
Historical failure rate comparison for students
from Mech 2 and conventional program in benchmark courses

	Conventional		Mech 2	
	Number of courses	Average failure rate	Number of courses	Average failure rate
Engineering design courses	19	5.4%	8	1.1%
Engineering science courses	43	8.1%	10	2.3%
All Third Year MECH courses	62	7.3%	18	1.7%
MECH 466 course	7	3.9%	2	0.4%

Future Developments

The Third and Fourth Year Mechanical Engineering curricula at UBC are designed to continue and strengthen the educational and developmental processes started in Mech 2. These curricula provide increasing proportions of elective studies, whereby students can choose to specialize in areas that support their personal and career aspirations. Consequently, the tight coordination among subjects practiced in Mech 2 is neither possible nor desirable. However, substantial coordination among the core subjects occurs, encouraged in recent years by the success of Mech 2. Most Mech 2 teachers also teach Third or Fourth Year courses, so cross-year communication occurs naturally. Third and Fourth Year teachers meet informally to plan the content and sequence of the overall syllabus. This involves planning specific course topics, timetabling, arrangement of labs and major projects. In addition, care is taken to ensure that consistent messages are given. The methodologies that are introduced in Mech 2 are reinforced in the Third Year and applied in the Fourth Year. Following the example of Mech 2, increasing coordination is now occurring within the Third Year Design curriculum and the set of courses has informally taken on the name "Design 3"; it is expected that the Design 3 name will be formally

adopted in one or two years. Moreover, collaboration is now occurring over the entire design curriculum, from Second to Fourth Year.

Complementing the university studies, the majority of students participate in "Co-operative Education", where they alternate terms between UBC and 4- or 8-month industrial work placements. (Among the various Engineering departments at UBC, Mechanical Engineering has the highest co-op enrolment, about 80%). To supplement the academic analysis of the impact of Mech 2 on student learning and development described in Section E, it is planned to survey and interview Co-op employers to determine if they have perceived a difference in the characteristics of students from Mechanical Engineering at UBC since Mech 2 was initiated.

A non-curricular, but very important outcome of Mech 2 has been a marked increase in coordination and co-operation among instructors. Previously, instructors tended to focus on their own courses, with only formal coordination with other courses. The close interactions among the Mech 2 instructors have given example and encouragement for group-based course planning. This model has transferred to the Third and Fourth Year instructors, as is evident by the gaining strength of the Design 3 group. The instructors are now meeting regularly and the rising enthusiasm for future curriculum developments is becoming very apparent.

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Section E—Supplementary Material

The following material is provided to supplement the application package:

1. **The Mech 2 Team**—A summary of the faculty and staff who together deliver the Mech 2 Program.

2. **Comments from Students**—Comments about Mech 2 drawn from program surveys and student correspondences.

3. **Letters from Student**s—Letters of recommendation for Mech 2 provided by the following students:

    - Victor Wang, former Mech 2 student (2005W cohort)
    - Craig Tomsett, former Mech 2 student (2006W cohort)
    - Parisa Bastani, former Mech 2 student (2005W cohort)
    - Geoff Hodgson, former Mech 2 student (2004W cohort)
    - Joshua Laye, current Mech 2 student (2007W cohort)

The Mech 2 Team – 2007W

Person	Affiliation	Academic Status	Role
Dr. Elizabeth Croft	Mechanical Engineering	Associate Professor and Assistant Department Head (External)	MECH 221 Team Leader; Dynamics Instructor
Dr. Martin Davy	Mechanical Engineering	Assistant Professor	Solid Modelling Instructor
Mr. Markus Fengler	Mechanical Engineering	Lecturer	Drafting, Machining, and Mechanical Design Instructor
Dr. Sheldon Green	Mechanical Engineering	Professor and Department Head	Fluid Mechanics Instructor
Dr. Antony Hodgson	Mechanical Engineering	Associate Professor	Mechanical Design Instructor
Dr. Philip Loewen	Mathematics	Professor	Multi-Variable Calculus Instructor
Dr. Peter Ostafichuk	Mechanical Engineering	Instructor	Program Coordinator; MECH 220 and MECH 223 Team Leader; Lab Coordinator; Math and Physics Review, Statistics, and Mechanical Design Instructor
Dr. Warren Poole	Materials Engineering	Professor	Materials Engineering Instructor
Dr. Gary Schajer	Mechanical Engineering	Professor and Assistant Department Head (Teaching)	Instrumentation and Solid Mechanics Instructor
Dr. Steven Rogak	Mechanical Engineering	Associate Professor	Thermodynamics Instructor
Dr. Tatiana Teslenko	Centre for Professional Skills Development	Senior Instructor	Technical Communications Instructor
Mr. Michael Schoen	Centre for Professional Skills Development	Sessional Lecturer	Technical Communications Instructor
Dr. Brian Wetton	Mathematics	Professor	Differential Equations Instructor
Dr. Joseph Yan	Electrical Engineering	Assistant Professor	Electric Circuits Instructor

Comments from Students

The following comments are drawn from student exit surveys and email correspondences (as noted).

- The way that the course material is taught is far more effective than the conventional approach, and the project courses are absolutely amazing. After completing Mech 2, I definitely feel that I have a better sense of what engineering is all about… Considering how much material that second year mechanical engineers are expected to cover, Mech 2 does a great job of teaching the material as efficiently and effectively as possible… This program was absolutely amazing, and I would recommend it to anyone who was interested in it. (2005W Exit Survey)

- I like how the things we learn in math are related to the things we do in the other classes. The materials covered in math are also timed very well so that we would have the required techniques to do the problems in the other classes. (2005W Exit Survey)

- I love the personal interaction with professors, TAs, other staff and a broad range of students. On the whole, we are one of the most co-operative groups at the University. Comparing Mech 2 to my experience in science puts this into perspective. I usually didn't attend class in science because there was no real incentive and not much social interaction. In Mech 2, the support network is amazing and the training is unique and powerful. (2005W exit survey)

- The integrated courses are great; topics relate to each other and this helped me understand the overall engineering science more. (2005W Exit Survey)

- The entire experience of Mech 2 is a worthwhile endeavour. It is not so much the academic material that made the experience worthwhile. It is the skills developed (study skills, time management, learning efficiency) that made Mech 2 valuable. (2006W Exit Survey)

- I love integrating all the courses to avoid overlapping material and wasted time. I also love how I go to most classes, labs and lecture with the same people. Mech 2 is really my second family for the time I spend every weekday away from home. (2005W Exit Survey)

- This program allows students to really get to know one another. I was able to form groups to work on problem sets and labs, etc. We pooled our resources and helped each other out. (2004W Exit Survey)

- [Q: What were things you found enjoyable about Mech 2?] The integration of each subject with others. This is what we need to know how to do. Combine everything and apply it. I am very glad that Mech has changed to this new method. (2004W Exit Survey)

- Question—What were the two things that you felt worked well in Mech 2?

  The environment. Mech 2 has been probably the most trying 8 months of my life, but I wouldn't trade it for anything else, simply due to the relationships I have developed. Please continue doing everything you can to encourage the community like we have seen emerge this year, between students, instructors, and TAs.

The emphasis on not only academic learning, but also teamwork and hands-on skills. After speaking with second year students in all of the different departments, there is not the same emphasis on the non-academics, which are still needed to succeed. (2005W Exit Survey)

- I really enjoyed this year's experience. It saddens me that future years won't be this fun, rewarding or integrated so well. I'll never forget my experience in Mech 2, the people I met and the things I got to do. Please keep this program, encourage it and advertise it. Programs like Mech 2 make better students, better engineers and better people. (2006W exit survey)

- I think that the Mech 2 program is great and I couldn't be happier with being here. In particular, I find that the support and passion that the instructors demonstrate is great. Thank you, I did not believe that this kind of learning environment could be provided at an institution as large as UBC. (Email from Mech 2 student, Andrew Porritt, reproduced with permission).

- I had a fantastic year in mech2. The program was a great change from the conventional style of classes and will make me miss it next year… The atmosphere was very unique and going to class was fun as everyone knew each other from the integrated nature of the program. (2005W Exit Survey).

9472 Desmond Road
Richmond, BC V7E 1R1

January 6, 2008

To: Alan Blizzard Award Selection Committee

Re: Support for Mech 2 Program

The progressive Mech 2 undergraduate program at UBC cultivates student development and demonstrates both pedagogical vision and student involvement. As an alumnus of the Mech 2 program, and as the former Second Year Student Representative, I highly recommend the Mech 2 program for the Alan Blizzard Award.

Instead of learning mathematics, materials, electronics, and mechanics as separate, seemingly uncorrelated disciplines, students in Mech 2 receive a unified education in which the interdependencies between subjects are clear. For example, even the standard UBC technical writing course is integrated with the Mech 2 engineering design projects in the form of reports and presentations relevant to our specific designs. By recognizing the student need for a unified approach to engineering education, Mech 2 improves student development by increasing the time spent actually learning, instead of juggling disparate midterms and assignments. Further innovations of the program which directly impact student success include an educational partnership with the British Columbia Institute of Technology (BCIT), pioneering of new web-based learning systems, and unrivalled flexibility and responsiveness to students.

The dedicated team of instructors behind Mech 2 is not only open to student input, but also proactively seeks to involve students in planning, implementation, and assessment. For example, multiple surveys are conducted each semester to gauge student satisfaction and opinion, and student delegates are invited to faculty feedback sessions. Even details such as design project specifications, lecture hall air conditioning, and exam scheduling are flexible and treated as important to the student experience. In Mech 2, students are part of the decision-making process.

Personally, I feel that the Mech 2 program has provided me with the best learning environment possible, and has allowed me to become involved in my own education. I strongly recommend Mech 2 for the Alan Blizzard Award. If you would like more information, please contact me by telephone at 778-859-1565 or by email at vwang@interchange.ubc.ca.

Sincerely,
Victor Wang
Former Second Year Student Representative, 2006W
Mechanical Engineering

303-2015 Trafalgar Street
Vancouver, BC V6K 3S5

January 7, 2008

Alan Blizzard Award Selection Committee
c/o Department of Mechanical Engineering
The University of British Columbia
2054-6250 Applied Sciences Lane
Vancouver, BC V6T 1Z4

Dear Alan Blizzard Award Selection Committee,

It is my pleasure to be able to provide this letter of support for the application of the University of British Columbia's Mech 2 program for the Alan Blizzard Award. As a student who has completed the Mech 2 program I am familiar with its operation, and the positive way in which it influences a student's learning experience.

Traditional second year programs have independent courses, teaching separate principles. One of the greatest advantages of the Mech 2 program is its integrated teaching method, in which close cooperation between professors ensures that the content is delivered to students in a much more cohesive manner. This reduces the overlap between courses, but more importantly allows us as students to see connections between what would have otherwise been discrete modules. This increases our interest in the course material and ultimately enhances the learning experience. As well as the cohesive content delivery, collaboration between the professors in generating assessment material also helps us to obtain a much more thorough understanding of the course content.

In addition to the outstanding content delivery, the introduction of challenging design projects into the curriculum also greatly enriched the learning experience. The projects allowed us to see the practical applications of our theoretical knowledge, and collaboration with our project groups gave us valuable experience of working as part of a team. As well as developing important group skills, working with other students on practical projects greatly increased student involvement and motivation.

I completely support the Mech 2 program, and my time in the course was the most rewarding part of my academic career.

Sincerely,

Craig Tomsett

Re: Mech 2 Supporting Letter for the Alan Blizzard Award

Dear Award Committee,

My name is Parisa Bastani and I am a 4th year student in Mechanical Engineering, Mechatronics option at the University of British Columbia. I was enrolled in the Mech 2 program in 2005 and I believe that this program has had a remarkable effect on my academic success and personal growth. Therefore, I strongly recommend the UBC Mech 2 program for the Alan Blizzard Award.

The Mech 2 program is designed to integrate all the second year courses and provide them in a specific order to highlight the interrelations and practical applications of these courses. Various lab sessions have also been designed to support the concepts taught in class in form of a practical problem or an experiment. Moreover, the focus of this program is providing students with a lot of hands-on experience. Specifically, Mech 2 started with a month of training on the four main sections of manufacturing, that is, drafting, modeling, machining and electronics. All these sections are taught while working towards manufacturing of an interesting project called the Maglev. By the end of the first month, we were trained on how to draft a design idea, how to model it using a solid modeling program, how to machine different parts and assemble them and how to solder and assemble the electrical components. This was truly a great achievement for students who just started their second year a month ago!

Mech 2 is a very intensive program and involves a heavy course load which led me to learn how to efficiently mange my time and how to effectively work under pressure. These skills have helped me manage my time so well that it has allowed me to take full engineering course load (6-7 courses a term) with an A average, play different sports, and volunteer in different extracurricular activities at UBC. I believe that Mech 2 has given me the opportunity to learn my capabilities and enjoy learning engineering in depth.

Moreover, I believe that Mech 2 takes education to another level by teaching students more than just the science and the applications. In Mech 2 we all got the opportunity to learn and practice leadership, team dynamic, and problem resolution in practical situations. I believe that our Mech 2 training has had a substantial effect on my leadership roles. I am currently the team captain of the Formula SAE UBC team, which is the largest student team at UBC with 55 team members. We design and manufacture a formula style race car from scratch every year and compete internationally. I have used the techniques that we learned and practiced in Mech 2 in various situations during my involvement on the team, and each time I have been amazed with the result. I have taken a number of leadership roles after completing Mech 2 and I do believe that Mech 2 has given me the base to succeed as a leader in some rather harsh environments and difficult situations. For example, I am the first Canadian female team captain in the Formula SAE West competitions with over 100 universities participants from around the world. I think that working in a male dominant environment, especially in the extreme case of race car production and the automotive industry, and getting elected as a leader in such an environment is a remarkable achievement, which needs a lot of hard work, engineering knowledge, and leadership skills. And I believe that Mech 2 has given me the confidence, the skills and the vision for this achievement.

Moreover, Mech 2 helps students develop skills that are directly used in the industry and valued by the employers. It is very interesting that all of the employers that I have worked for during my 4 co-op terms have acknowledged the effectiveness of the newly designed Mech 2 program and have supported this new way of learning. I worked for the Toyota manufacturing plant during one of my co-op terms and

they mentioned how surprised they were by the amount of practical skills, design knowledge and mature content that we cover during the first three years of our education.

In conclusion, I would like to emphasize the effectiveness of this innovative program and its incredible effects on my engineering career and personal growth. I believe that Mech 2 not only provides students with the opportunity to develop important engineering and leadership skills but it also makes learning very enjoyable. Therefore, once again I would like to strongly recommend the UBC Mech 2 program for the Alan Blizzard Award. Please do not hesitate to contact me via phone at 604-781-9830 or via email at pbastani@formulaubc.com if I can be of any further assistance.

Best Regards,
Parisa Bastani

Team Captain, Formula SAE UBC
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To Whom It May Concern

I am a 4th year mechanical engineering student who had the pleasure of being in the first class to go through the Mech 2 program. Although I already had a degree in mathematics from UBC, my experience in the Mech 2 program was completely new to me. It introduced me to team based learning, pushed me to apply skills across different subjects, and forced me to use my knowledge and skills in practical projects and competitions. While I do not at all feel that my first university education was deficient, it does not compare to the quality of my Mech 2 experience.

Mech 2 began with classroom teaching, but it was immediately apparent that it was different from a regular program. Separate courses in mechanics and electronics and mathematics were grouped together to teach the same methods of analysis at the same time. We learned that lessons are not limited by their classroom context, and can be applied in almost any situation. The same equations that describe circuits can be used on vibrating mechanical systems, and now that I am further along in my education, I am not surprised that the same techniques work for control systems and chemical reactions. This interconnectedness of subjects has made my previous math courses more useful than I ever thought they could be.

The group design courses were a large part of the second semester of Mech 2. These were definitely the most difficult part of the curriculum, but also the most exciting and enjoyable. The initial design phase taught us the value of quick calculations to test the feasibility of our ideas, and tested our ability to make decisions as a group. Knowledge from our classes was required in the design phase also, so studying the material was replaced with applying it. Having two projects allowed us to learn from early mistakes and improve our communication and organization. The most striking lesson from the competitions was seeing the success of ideas that our group had dismissed as infeasible or impossible. I am now much more careful to not reject ideas since there are very few things that cannot be overcome by persistence and ingenuity.

Team based learning was also used extensively in Mech 2. Although the readings were individual, being a member of a team was a strong motivator. Discussions during team tests challenged what we thought we knew and opened our minds to different perspectives. I appreciate that a wide range of experiences improves a group and its ability to solve problems.

The lessons from Mech 2 have definitely improved my entire engineering education. I am far more confident in my ability to learn on my own outside a classroom, but I hope to always be in the company of people with whom I can share learning. In studying new subjects, my mind wanders to how it all relates to what I know, and why there are similarities or differences. I think that this program has gone beyond expectations in creating students more interested in learning, and eventually more proficient engineers.

Sincerely,

Geoff Hodgson

Joshua Laye
4046 West 20th
Vancouver, BC V6S 1G5

January 7, 2008

Alan Blizzard Award Selection Committee

Re: Letter in Support of Mech 2 Program

My name is Joshua Laye, I am a second year mechanical engineering student, currently in the Mech 2 program, and sitting as the second year representative in the Mechanical Engineering club, Club Mech. It is an honour to be able to be a student going through this program and to support Mech 2 for the Alan Blizzard Award.

Unlike traditional mechanical engineering programs, Mech 2 is unique. Instead of having separate courses all semester long, related courses are combined into modules where the material between the courses is similar and put to use by solving engineering problems. This different learning style has improved my capability to grasp concepts and apply these same concepts to many different problems. The instructional staff have been great by providing the necessary means to become a professional engineer.

Mech 2 staff work together to create lectures which collaborate with each other in order to give a new and meaningful perspective on learning. The material covered in lectures is then conveyed and put to use on different problems during the course related tutorials. In order to fully understand the concepts taught in class, frequent labs are part of my schedule which gives me a chance to see where these concepts may be used in every day technologies. Using all the information that has been delivered in the modules, we then get to design, machine, assemble, present, and compete two projects. All of this has greatly improved my understanding of the material provided during the lectures.

Mech 2 is a great program which deserves recognition for the effort put into it by all the instruction and support staff, and also for the new adventure that is offered to everyone who enters this program.

Sincerely,

Joshua Laye
Mech 2 Student and Second Year Representative
Mechanical Engineering