

THE WOOD PRODUCTS PROCESSING PROGRAM AT THE UNIVERSITY OF BRITISH COLUMBIA: REFLECTIONS ON THE LAST TWENTY-FIVE YEARS

*Simon Ellis**

Associate Professor, Wood Products Processing Program Director
3M National Teaching Fellow (Canada)
Department of Wood Science
Faculty of Forestry
University of British Columbia
2357 Main Mall
Vancouver, Canada V6T 1Z4
E-mail: simon.ellis@ubc.ca

(Received April 2020)

Abstract. The Department of Wood Science at the University of British Columbia initiated its Wood Products Processing (WPP) program in September 1995. The program replaced a previous wood science-based program, which, like many programs across North America at the time, suffered from low enrollment levels. The new program introduced a greater focus toward manufacturing processes, their analysis and optimization, and aspects of business operations. This article describes the establishment of some of the essential components of the WPP program and their development over the last 25 yr. Enrollment, co-op program, and graduation data are presented. The transfer programs established with Chinese forestry universities, which have fueled recent WPP program growth, are detailed. Some areas where the program has met with less success are discussed, as are some recent developments of the program.

Keywords: Wood products education.

INTRODUCTION

September 2020 marks the 25th anniversary of the first intake of students into the B.Sc. (Wood Products Processing [WPP]) program at the University of British Columbia (UBC). This milestone is an appropriate occasion to reflect on the development and accomplishments of the program over the previous two and a half decades, to report on the current status of the program, and to look ahead to some possible future directions of the program.

The WPP program is delivered by the Department of Wood Science (DWS) in the Faculty of Forestry at the UBC in Vancouver, Canada. It is one of the five undergraduate programs currently offered by the Faculty of Forestry. The WPP program was developed as a direct response to a demonstrated wood products industry need for

university-level graduates to take on supervisory and management roles. The degree is a fusion of science, engineering, and business, which prepares graduates for careers in the wood products sector and related fields.

Barrett and Cohen (1996) described the background to the establishment of the program. A group of Canadian wood products industry champions came together to form a national body dedicated to promoting relevant education programs. The group selected the UBC's proposal to develop and offer the undergraduate program envisioned. In part, what we gained as a result was the support of employers who clearly wanted to hire students from such a program, as co-op students while they are in the program and then as graduates on completion of the program. In essence, we had a genuine industry "pull" from employers rather than an academic "push" of a program developed in a more traditional ivory

* Corresponding author

tower manner. The support of the industry group was a large driving force behind our successful applications for funding from provincial and federal agencies. It is that industrial relevance which has been a key driver in the success of the WPP program—it attracts students to the program and helps us maintain contemporary, relevant educational content.

An essential component of the establishment of the WPP program was the Centre for Advanced Wood Processing (CAWP). The CAWP is Canada's national center of excellence for education, training, and technical assistance in the wood products manufacturing industry. The CAWP offers a wide range of training courses, professional e-learning programs, in-plant training, product development, and manufacturing improvement services. Faculty and staff members also conduct and coordinate applied research and development through the CAWP. The practical facilities housed in the CAWP provide an essential component to the practical aspects of the WPP curriculum. The program does not train machine operators, but knowledge of and skills in the safe operation of wood processing machinery are essential to demonstrate certain principles and practices which contribute to the educational wealth of the program.

BACKGROUND

In 1981, the UBC Faculty of Forestry created three departments, one of which was the Department of Harvesting and Wood Science. At the same time, the faculty also created new designations for some of its undergraduate degree majors, thus started the Wood Science and Industry (WSI) major within the B.Sc. (Forest Sciences) degree program. As shown in Fig 1, the initial intake into the major was very small, growing slowly to an average annual enrollment of 20-25 students by the end of the 1980s.

Following an external review of the faculty in 1992, the Forest Harvesting group moved to one of the other departments, and our department was renamed the DWS. At the time, there were 10 faculty members in the DWS. Although all faculty members ran active research programs, quite simply, the number of undergraduate students in the WSI major did not justify the number of faculty positions in our department. The dean of the Faculty of Forestry encouraged the DWS to consider changes to our undergraduate program to make it more attractive to prospective students.

Thus, in 1993, the DWS held a series of meetings to discuss potential areas of development. The main outcome of those discussions was a decision to adjust the WSI major to have more of a manufacturing

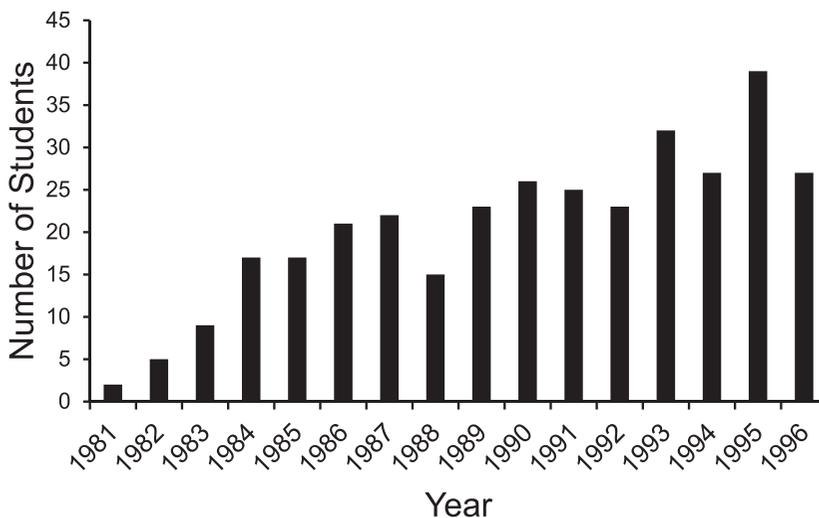


Figure 1. Annual enrollment in the Wood Science and Industry major from 1981 to 1996.

focus rather than the existing more narrow focus on wood material science. We also resolved to broaden the wood products industry sectors targeted. The WSI major focused almost exclusively on the primary, commodity solid wood products sector (eg softwood lumber, plywood, and oriented strand board). Our new offering would add more content covering secondary or value-added processing operations (eg furniture, windows and doors, cabinets, and architectural millwork).

At approximately the same time as our internal planning discussion, a group of companies manufacturing a range of wood products (mainly in the value-added product sector) had created a group called the National Education Initiative (NEI) of the Furniture and Secondary Wood Industry. Facilitated by staff from Industry Canada, a federal department with the mandate of fostering a competitive and knowledge-based Canadian economy, the NEI Industry Advisory Board developed a vision of a range of educational programs focused on wood products manufacturing. At the peak of that range was a university degree program. The NEI put out a call for proposals for Canadian universities interested in developing and hosting such a degree program.

The UBC Faculty of Forestry (1994) submitted an extensive proposal to address the establishment of an undergraduate program. Also included in the proposal was a center for applied research in this domain, a critical component for any such endeavor to be successful based at the research-intensive UBC. The proposal also addressed development of continuing education programs for the existing workforce in this sector. Given the critical mass of faculty members in the wood science area already present in the DWS, and informed by the exploratory work we had already accomplished through our own internal review process, the quality and comprehensiveness of our proposal led to its unanimous selection by the NEI Board. Following this decision, work began on multiple fronts. External funding of Can\$22 million (1995 dollars) was raised from a combination of provincial and federal funding sources (Barrett and Cohen 1996). Curriculum development, which had already begun to some extent,

was sharply accelerated in anticipation of launching the new program. The first intake of students into the new WPP program in September 1995 was actually admitted into the WSI major until we were able to create the new B.Sc. (WPP) degree program in 1996.

PROGRAM DESCRIPTION

Curriculum Development and Delivery

The initial curriculum content was driven, in part, by the findings from an educational needs survey of Canadian wood industry executives with responsibilities for hiring and management (Cohen and Maness 1995). The results of the survey provided direction for the balance of content between fundamental theoretical subject content, and applied and technical skills education. They also provided some finer details regarding the relative importance of specific content in the wood material science, mechanical processing, and production management areas.

The core aim of the program was for students to develop a sound base of understanding of wood material properties, industrial manufacturing processes, and key business and management skills to permit production and financial analyses. Essentially, we reduced the classic wood science content of our existing WSI undergraduate program and developed a focus on manufacturing principles and practices. Instructors revamped nearly all the courses they had previously taught. The reduction of classic wood science content was a challenge for some instructors, but the proportion of such content in the curriculum simply needed to shrink to permit the introduction of the new courses. The focus is on the solid wood products sector—there is very little pulp and paper content covered in the program. We also introduced an increased emphasis on transferrable or metaskills such as communications, teamwork, problem-solving, leadership, and critical thinking skills. These skills are embedded within many of our courses rather than offering them in a stand-alone course. The importance of developing such metaskills has been identified by other North American wood science programs (Smith et al 1998).

Another fundamental change we made was in our approach to how we taught our classes. Rather than being instructor-driven in terms of what we taught, the new program was designed to be more student-centered, focusing on what and how the students' learned. The DWS worked closely with staff from the teaching development center on our campus in this regard. Nearly all instructors undertook a 3-d Instructional Skills Workshop, at a minimum, to help adjust their teaching styles. Over the first few years of the program, we continued to work with the same educational experts, who helped us in particular areas such as curriculum integration, teaching and evaluating group work skills, and monitoring other transferrable skills development throughout the program.

Some of the courses in the WPP program and the content of some of the courses have changed since the first graduating class completed their final courses in 1999. Our approach to managing the curriculum in the program has been one of the "preventative maintenance"—generally, we have tried to be anticipatory of needed curriculum changes and where necessary respond very rapidly to making such changes. Curriculum change in university programs can sometimes be a slow process, as necessary documents work their way through various university committees. We have followed that process to formally enact needed curriculum changes, but we have often moved more nimbly and enacted changes ahead of their formal adoption by using directed study course codes, which permit courses to be offered on a trial basis. Because we are a relatively small program on our university's campus and we have a rigid program in which students move through the program in cohorts, we have been able to manage such a flexible curriculum with relative ease compared with what might be experienced in a program with a larger enrollment and more elective freedom. However, we have also, on a couple of occasions, taken a step back, performed comprehensive curriculum reviews, and made more wholesale changes in the overall content of the program. The titles of the current courses in the program are shown in Table 1.

Program Enrollment

The target capacity of the WPP program was determined by several factors. The survey of industry executives (Maness and Cohen 1995), an independent consulting report (Binder 1993); focus group meetings (unpublished); and a special conference on wood products manufacturing education in BC (unpublished) all suggested a graduating class size of 35-50 would meet Canadian industry demands at the time. The target for the total enrollment in the program was set at 180-200 students. Given we had only enrolled 95 students, graduating 79 of them in the WSI major since its inception in 1982, this target was somewhat daunting at the time.

Student enrollment levels since the program began are shown in Fig 2. Students were accepted into years 1 and 2 in September 1995. Student enrollment in the program grew steadily in the first years of the program and then stalled as graduates began to leave the program (our first group of graduates left the program in May 1999). Enrollment in the program remained at approximately 100 students for most of the next decade. It was only with the advent of the transfer programs with Chinese forestry universities that enrollment climbed toward our initial target.

Second year intake was possible because the first year of the program consisted of courses which could be completed at most universities in Canada. The exception was an introductory course to wood products and their global trade. This course was scheduled to fit into the course timetable of new students entering second year. The dual year entry approach has been maintained, and in some years, most of the intake of domestic students consists of postsecondary transfer students who enter into the second year of the program. In the British Columbia education system, there are a number of postsecondary community colleges offering university-transferrable courses. Students can attend these colleges, complete 1 or 2 yr of courses, and then transfer to one of the universities in the province. Over the life of the program, 39% of our students have joined directly from high school, 21% have

Table 1. Sequence of courses in the Wood Products Processing program.

Term 1	Term 2
Year 1	
Differential Calculus	Integral Calculus
Chemistry I	Chemistry II
Physics I	Physics II
Introduction to Wood Products and Global Trade	English
Elective ^a	Elective ^a
Year 2	
Microeconomics	Communications Strategies
Introduction to Biometrics	Computer Programming
Quantitative Methods in the Wood Industry	Contemporary Topics in Forestry and Wood Products
Mechanics of Wood Products	Wood Physics and Mechanics
Wood Anatomy and Identification	Secondary Wood Products Manufacturing
	Two-Dimensional and Solid Computer-Aided Graphics
	Wood Machining Skills ^b
	Mill Site Visits ^c
Year 3	
Industrial Engineering	Logistics and Operations Management
Machine Components	Wood Finishing and Protection
Wood Adhesives and Coatings	Wood Industry Business Management
Wood Sawmilling and Drying	CAD/CAM
Applied Mechanics of Materials	Wood Composites
Quality Improvement	Senior Elective ^d
Year 4	
Financial Accounting	Globalization and Sustainability
Engineering Economics	Environmental Facilities Design
Furniture Construction	Wood Products Capstone
Modeling for Decision Support	Senior Elective ^d
Principles of Wood Cutting and Tooling	
Senior Elective ^d	

^a Can be any course.

^b Two-week course taken at the end of second year.

^c One-week course taken at the end of second year.

^d Must be third or fourth year-level courses.

transferred from local colleges, and 40% have transferred from other university programs.

Cooperative Education Option

The program is formally offered as a standard Canadian 4-yr degree program. Students may choose to participate in a cooperative education (co-op) option, which adds 1 yr to the duration of the degree. In the co-op option, students complete up to five 4-mo work term experiences in industry. The timing of the co-op work terms in the program is shown in Fig 3. While on a co-op work term, students perform productive jobs with companies such as introductory quality control data gathering and analysis, production analysis and improvement, product development, and

marketing and sales projects. The program has a full-time cooperative education coordinator and recruitment officer whose primary role is to deliver pre-employment workshops to students to prepare them for their initial employment experiences, maintain relationships with employers, coordinate the advertising and hiring process at three different times of the year, and monitor student progress during their work terms.

The co-op program is not mandatory, but the flow of courses in the program was developed with the anticipation most students in the program would choose to take co-op. Co-op has proven popular with our students, and 58% of graduates from the program have participated in the co-op option. Forty-three percent of the graduates completed the full amount of required co-op work terms,

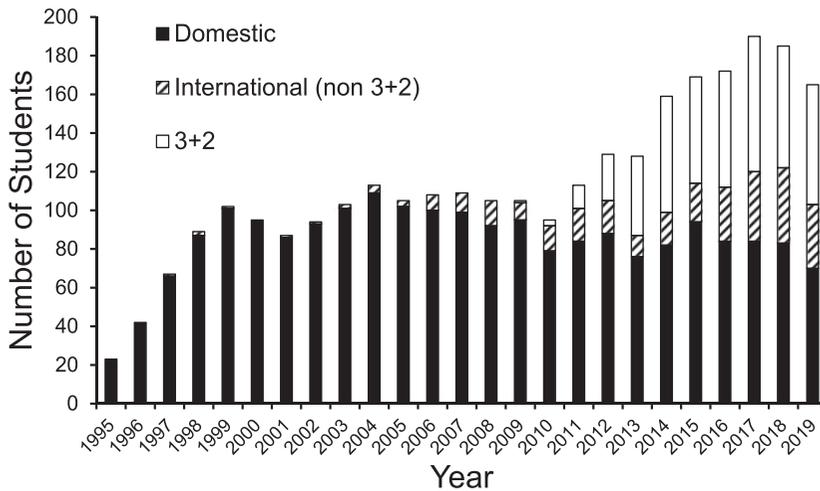


Figure 2. Annual enrollment in the Wood Products Processing program from 1995 to 2019.

thus receiving formal co-op designation in their degrees, although another 15% of the graduates completed fewer than the required number of co-op work terms.

Students are encouraged to seek a range of work experiences in co-op to become exposed to as much of the value chain as possible rather than seeking multiple experiences in only one part of the wood products industry. More than 1200 work terms have been completed to date—66% in British Columbia, 27% across the rest of Canada, and 7% internationally (including positions in Australia, China, Germany, Guatemala, Indonesia, Japan, New Zealand, South Africa, Switzerland, United Kingdom, United States, and Vietnam). Until the global financial crisis in 2008, the co-op program had a 100% placement record—every

student in the co-op program found work at the appropriate stage in their progression through the program. Figure 4 shows the number of co-op work terms completed each year from 1996 to 2019.

Co-op can be viewed as an opportunity for students to “test-drive” potential career opportunities and as an opportunity for employers to take a long look at potential full-time employees. Co-op is sometimes described as “the longest job interview.” The co-op program is without doubt one of the most important drivers of the WPP program. It helps the program maintain excellent contact with the industry in which most of our students find employment after graduation. This contact helps us ensure the program’s curriculum is relevant, provides opportunities for tours of manufacturing operations by our classes, and

Year	Term 1 (Sep-Dec)	Term 2 (Jan-Apr)	Summer (May-Aug)
1	Basic Sciences		Summer
2	Wood Material Science		Co-op 1 (Junior)
3	Manufacturing Basics	Co-op 2 (Intermediate)	Co-op 3 (Intermediate)
4	Advanced Manufacturing		Co-op 4 (Senior)
5	Co-op 5 (Senior)	Integration	

Figure 3. Timeline for co-op work terms in the Wood Products Processing program.

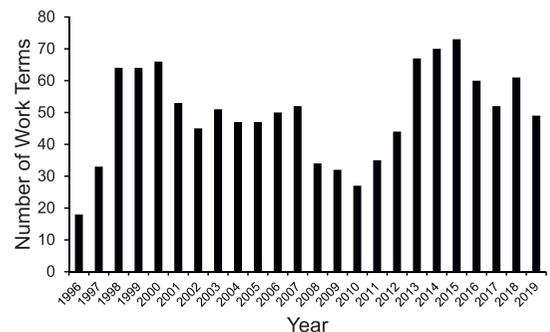


Figure 4. Number of 4-mo co-op work terms completed annually from 1996 to 2019.

provides state-of-the-art examples for use in our classes. Although over 200 companies have hired co-op students since 1996, there is a relatively small number of large companies who have hired most of the students—13 companies have employed 50% of our co-op students; 162 employers have hired less than five students each.

Co-op work terms also include an academic component, and students are required to either give a poster or oral presentation on their work or write a short technical report, which is marked by a faculty advisor familiar with the field in which the student has been working. Twice a year, Co-op Presentation Nights are held at which students give short presentations of their industry experiences. Students returning from their first work terms present posters outlining their experiences, whereas students who are more senior give 10-min oral presentations, usually with a focus on a particular project in which they were involved. Typically, approximately 40-50 industry guests attend in part to support the students who worked at their companies but also to view other students with a view to possible future co-op or permanent hires.

Minor in Commerce

Another option, which has proven popular with students, has been the minor in commerce—49% of graduates have chosen this option. The minor is a grouping of six courses offered by the UBC Sauder School of Business. The topics covered are organizational behavior, logistics and operation management, fundamentals of financial accounting, marketing management, business finance, and strategic management in business. By a happy coincidence, two of the six courses required in the minor in commerce (developed across the UBC campus in 1999) were already included in the original core requirements of the WPP program. Hence, students need only complete an additional four business courses to gain this qualification. Because all students in the program need to complete three senior level electives, effectively a student need only take one additional course to the regular course load to

gain the minor in commerce. The minor in commerce can be taken together with co-op—they are not mutually exclusive.

Transfer Agreements between UBC and Chinese Forestry Universities

The development of transfer agreements between the top Chinese forestry universities and UBC Faculty of Forestry has been a major strategy to increase enrollment across all of the undergraduate programs offered by the Faculty of Forestry. The original structure of these programs was for universities in China to deliver the equivalent content to the first 2 yr of the Faculty of Forestry's programs in 2 yr in China. Students completing these programs in China would then be eligible to transfer directly into third year of our programs in Vancouver with the intent to complete a UBC degree program in an additional 2 yr. Thus, the programs were originally termed "2 + 2" programs.

However, it was found that very few transfer students were able to complete their UBC degree programs in the "+2" years intended (for several reasons). Combined with the desire of the Chinese universities for the students to complete in China, a set of what we consider nontransferable courses, in 2015, a change was made to extend the duration in China of these students to 3 yr, and thereafter, the transfer programs have been referred to as "3 + 2" programs. The timely completion of students has increased greatly with this latter structure.

The first such student was admitted to the WPP program in 2009. Since then, enrollment of these transfer students has grown to the extent they now comprise 38% of all students in the WPP program. Although the Faculty of Forestry as a whole has established such programs with six Chinese forestry universities, each program in the faculty primarily draws students from only one or two of the partner universities. This approach allows for targeted stewardship of the transfer agreements. The WPP program was at the forefront of developing these transfer programs. In

some years, the WPP program has enrolled more than half of all the 3 + 2 students in the Faculty of Forestry. Our approaches taken in the management of these programs, from our review of curricula, to making contact with the prospective transfer students when they were still in China, to the processing of the students' transfer credits, have led the way to the establishment of best practices in the Faculty of Forestry in dealing with these students.

The WPP program has engaged primarily with Beijing Forestry University (BFU) and Nanjing Forestry University (NFU). To contribute toward the strengthening of the 3 + 2 transfer agreements, department members have made a total of 26 visits to teach in China since 2011. These visits generally involve 5-8 d of instruction to students in their second or third year of classes. The classes serve three primary roles. First, we attempt to cover subject areas in which we think the students could be strengthened to prepare them for the courses they will take at UBC. Second, the classes serve as an introduction to how some of us teach to introduce students to some UBC teaching styles. In general, the Chinese students are relatively passive learners in their regular classes in China and do not often ask questions or engage in discussions without explicitly being encouraged to do so. We try to introduce the students to a more student-centered teaching approach where active learning contributes to their classroom experiences. Third, the classes increase the exposure of the students to being taught in English. The exception to this intensive format has been when an instructor specifically hired for the role visited both BFU and NFU annually from 2015 to 2018. Those visits were each of 3-wk duration, and the classes taught comprised part of the students' regular BFU or NFU courses. The instructor effectively delivered half of some bilingual courses, which helped prepare the students for their studies at UBC. It has been very valuable for each of the 10 different faculty members who have taught in China. They have experienced the learning culture in which the 3 + 2 students have been immersed at their home universities and been able to

discuss various topics regarding the transfer programs with our Chinese partners. It is planned that recent and future hires in the DWS will also teach at least once in China to gain similar experiences. These visits also help strengthen the partnerships between the DWS and our counterparts in China. When faculty, department, or program administrators visit China, they are usually involved in meetings to review the status of the transfer programs or participate in formal events recognizing an important milestone or achievement.

Other International Students

Although China is the home country of the great majority of our international students, the international WPP students have come from a total of 20 different countries. In addition, students who are permanent residents of Canada (classified as domestic students at our university) have originated from an additional 19 countries. The countries of origin of these students are shown in Fig 5. It is fair to say our student body is truly international. The proportion of the international student body in our total enrollment is shown in Fig 2. It can be seen that the growth in international student enrollment is the reason behind our overall enrollment increase over the previous 10 yr. The higher average annual tuition fees paid by international students (over Can\$43000) compared with domestic students (just less than Can\$6000) represent a significant financial contribution to our department's annual budget. These funds have supported our ability to make new faculty hires and continue to provide quality educational experiences for all students in the WPP program.

GRADUATES FROM PROGRAM

Annual student graduation levels from the program are shown in Fig 6. Four hundred sixty-five students have graduated from the program from 1999 to 2019. Three hundred ten (67%) of the graduates have been domestic students, whereas 155 (33%) have been international students, with 108 of those (23% of all graduates) being 3 + 2

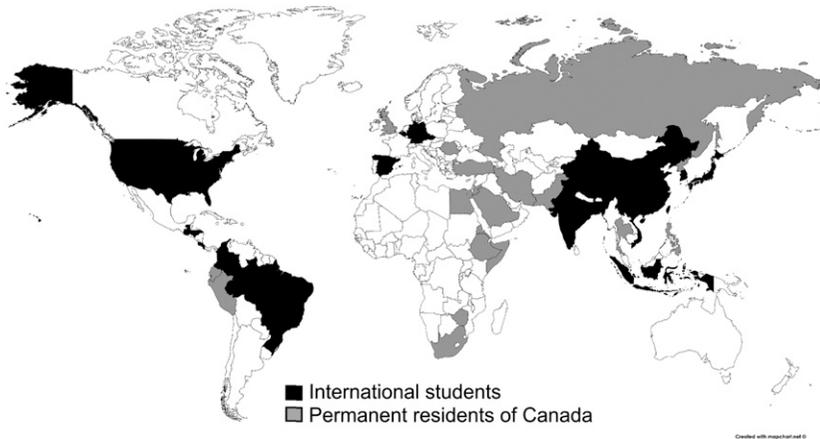


Figure 5. Countries of origin of non-Canadian students in the Wood Products Processing program from 1995 to 2019.

students. Forty-three percent of graduates completed the co-op option, while another 15% of graduates participated in, but did not complete, coop. Forty-nine percent of graduates completed the minor in commerce. Seventy-three percent of the graduates have been male, whereas 27% have been female.

We maintain close contact with our alumni. The Faculty of Forestry has a dedicated alumni relations officer who works with alumni from all five of the faculty’s undergraduate programs, and we also maintain an email distribution list, which includes over 85% of our WPP alumni. We use the list to distribute various news about the program we think will be of interest to our alumni—such as Co-op Presentation Night

information. Recently developed social media platforms also held to keep us engaged with our alumni. We regularly distribute information on permanent employment opportunities we receive from companies. From 2015 to 2019, there were an average of 34 such permanent employment opportunities sent out to this list each year. We have also sought input from our alumni regarding their experiences in the program and possible new directions our curriculum might take.

We had a tradition of more than 10 yr of hosting our soon-to-be-graduates for an evening of hospitality after their final year exams. The occasion served as an opportunity to celebrate their completion of the program and permitted us to receive some candid feedback from the students as they were about to embark on their post-graduate careers. Such input provided in a casual setting proved very valuable in informing some of our curriculum discussions. As the size of the graduating class grew dramatically in recent years, it became infeasible to host this function in the same manner. Instead, in 2017, an online exit survey was developed and deployed for the first time. Although the survey approach does not offer the same ability to engage in deeper conversations with the new graduates, the results have still provided us with valuable feedback, which has been fed into some of our discussions about the current or future initiatives.

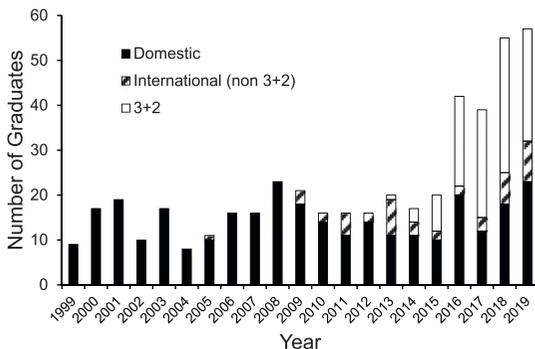


Figure 6. Annual number of graduates from the Wood Products Processing program from 1999 to 2019.

In October 2019, an extensive online survey was sent out to alumni from all UBC faculty of forestry programs (undergraduate and graduate) for whom contact information exists on the university alumni database. The response rate from WPP alumni was 45.4% (higher than that across all the other faculty of forestry programs of 40.4%). Of the WPP respondents, 64% were domestic students and 36% were international. Sixty-eight percent of WPP alumni reported their first meaningful job after graduation was related to their degree program, whereas 69% of WPP alumni reported their current job is very or fairly related to their degree program. We consider these last data encouraging because they confirm our students are gaining the knowledge and skills required to work in the wood products sector while also gaining sufficient transferrable skills to enable them to find employment in unrelated sectors.

Positive responses to how well their degree program had helped the alumni to develop various skills are presented in Table 2. Development of the first four skills in Table 2 was rated an average of 6% higher by WPP alumni compared with all forestry alumni. Written communications skills were rated only 1% lower. Of particular note are business management skills, which were rated positively by twice as many WPP alumni (80%) compared with all forestry alumni (40%). This wide difference is most likely due to the high proportion of WPP alumni having completed the minor in commerce option. WPP respondents were also particularly positive about their co-op experiences; 81% were promoters (designated as a response of 9 or 10 on a 10-point scale) regarding recommending co-op education to a student with similar career interests to their own.

RECENT DEVELOPMENTS

Field Trip

In 2017, we (re)introduced to the program requirements a tour of manufacturing operations. This course was offered in our previous WSI undergraduate program but was not included in the new curriculum as the introduction of the co-op option was thought to be how the students

Table 2. Wood Products Processing alumni responses to rating how their degree program helped develop various skills.

Skill	Responses		
	Excellent	Good	Total positive
Oral communications	38%	48%	86%
Problem-solving	43%	51%	94%
Project management	33%	57%	90%
Teamwork	52%	43%	95%
Written communications	31%	55%	86%
Business management	19%	61%	80%

would gain most of their practical industry experience. However, not all students participate in co-op, and those students who do participate find employment in dissimilar roles. To bring some more consistency to the exposure to industry among the students, we reintroduced the course, which involves a 1-wk tour of wood products manufacturing operations throughout the British Columbia Interior region. Facilities visited include sawmills, panel plants (oriented strand board, medium density fiberboard, and plywood), engineered wood products facilities (glulam and cross-laminated timber), a bioenergy (wood pellet) plant, a tree seedling nursery, and research and operational sites in one of the faculty's research forests. Students already have a visit to a range of manufacturing operations in the Vancouver area during their regular, campus-based courses, but this tour introduces them to operations in the BC Interior where forests and the manufacturing operations differ markedly from those on the BC Coast.

Mass Timber

UBC recently announced a faculty renewal initiative across its campus with more than 200 new faculty hires anticipated. There are currently more than 5500 faculty members at the UBC Vancouver campus (UBC 2019). Senior management in the Faculty of Forestry decided to focus the three new positions allocated to our faculty into one cluster. The topic area selected was mass timber and tall wood buildings. Together with two existing chair positions in the Wood Building Design and Construction field, these new hires will create a critical mass of researchers working

on a comprehensive range of issues pertaining to the design, manufacture, construction, and performance of such wooden buildings. Although the primary foci of this group will be research and graduate programs (both research- and course-based), it is anticipated that undergraduate courses in this area will also be developed. The segment of this growing wood products sector where WPP graduates can contribute most is in the manufacturing of mass timber products such as cross-laminated timber and glue-laminated timber. With manufacturing capacity of mass timber products growing by the expansion of existing plants and new ones starting up, we foresee an increase in the opportunities for our graduates in this field.

New Degree Program

Over the previous decade, several wood-based undergraduate programs in the United States have made changes to their traditional wood science curriculum content (Smith and Valverde 2019). The nature of these changes has included creation, merger, or replacement of degree programs. Administrative changes, including the renaming of academic units, have also often accompanied these curriculum changes. At the UBC, we made the change from our old WSI program with the introduction of the WPP program in 1995 and we have not seen the need to change the core nature of that current degree program. Student enrollment has gradually climbed to reach our original goals, and the satisfaction levels of the graduates from the program and the employers who hire them have remained high. Rather than changing our existing program, to address the growing need for students with a wider bio-based materials background, we have developed a new degree program. In September 2020, the first students will be admitted to the Forest Bioeconomy Sciences and Technology (BEST) program. In the BEST program, students will gain a solid foundation in science and technology for the innovative design and development of renewable materials, energy, and sustainable land-use strategies. Initial interest in the program from prospective students has been

strong, and a full cohort of enrollment into first and second year is anticipated.

WHERE WE HAVE NOT BEEN AS SUCCESSFUL

This article would not represent the whole tale of our journey if it did not address some of the areas where we have not met with as much success as we have with the rest of the program.

Specializations

One regular request we receive from our undergraduate students, which we have been unable to meet, is the creation of more specialized streams within the program. We had hoped that as enrollment levels rose, we would be able to offer groupings of courses which would permit students to specialize in a particular field of wood products. However, because approximately half of the senior students choose to complete the minor in commerce, the remaining students are of such a number that dividing them across multiple streams would result in nonviable class sizes. Currently, those students who do not select the minor in commerce self-select the three senior elective courses required (taken at the third or fourth year level). Although less extensive than full streams of concentration, we have attempted to identify courses offered outside the Faculty of Forestry, which might provide discrete clusters of knowledge content. Examples of two such groupings are in data analysis and wood buildings. With the new faculty hires discussed earlier, the courses on wood buildings should become sustainable in the long term.

Design

Another area in which we have not made as much progress as hoped when we started the program has been in the design arena. We have not had a full-time individual on our teaching staff with a background in creative design. Through a teaching “barter” with a local arts college (Emily Carr Institute [now University] of Arts and Design, ECIAD), we were able to offer a course on

industrial design from 2001-2004. In exchange for this teaching, one DWS faculty member taught ECIAD fine arts students about wood. We have also offered individual-directed study courses for students wishing to pursue particular furniture design/build projects. However, such directed study courses involve considerable instructor time (in addition to the instructor's regular teaching load) and cannot be offered to more than a handful of students at any one time. Fortunately, at the time of writing of this article, we are conducting a faculty search for an individual to teach two product design and development courses we have developed, as well as to take on the longer teaching stints in China. This hire will allow us to provide students with some focus in the design theme.

Professional Engineering Status

Prospective students to the WPP program (and our alumni) often inquire about whether completion of the program can lead to future registration as a professional engineer. Such professional standing is governed in our province by Engineers and Geoscientists BC (EGBC). We have long recognized such a path for graduates from the program would be a very valuable recruitment tool. It was never envisaged all graduates from the program would be eligible for the Professional Engineer route. Instead, it was hoped to be able to identify a potential set of competency deficiencies which could be addressed by a suite of courses a WPP student might complete through selection of appropriate elective courses and in an additional year of study at the UBC. Although some of the discussions we have held with EGBC over the life of the WPP program have offered us some hope that we could achieve our goal, we have not been able to bring such an arrangement to fruition. Individual graduates can apply to EGBC and write challenge examinations to demonstrate their competency in a particular subject area in which they are deemed to be lacking. We are offering what support we can to any such individuals in terms of providing relevant course materials explaining their studies completed in the WPP program.

EXTERNAL RECOGNITION

Awards

The program has won two prestigious awards. In 2002, it was recognized by the Yves Landry Foundation, an organization honoring the memory and values of the chairman, president, and CEO of Chrysler Canada Ltd. from 1990 to 1998, to advance technological education and skills training to resolve the skilled labor and technical professional shortages facing Canadian industry. The WPP program was selected as the most innovative Canadian university-level manufacturing technology program. In 2004, the program won the UBC Alfred Scow Award, which recognizes exceptional contributions or significant improvements to the student experience and learning environment at the UBC.

Consultations

The successes of the WPP program have led to several institutions around the world seeking out our advice regarding the development of similar programs suited for their own educational and industrial contexts. Faculty and staff from the WPP program and the CAWP have served in advisory roles to key staff members from Universidad Del Bio Bio (Chile), Waiariki Institute of Technology (New Zealand), and the University of Stellenbosch, and Nelson Mandela Metropolitan University (South Africa). The last of these ventures involved an extensive project funded by the Canadian International Development Agency to collaborate in the development of capacity in distance education courses in wood processing (Evans et al 2010). We have also recently assisted Okayama University (Japan) in their establishment of a work experience program similar to co-op. Over the life of the program, representatives have been invited to make presentations about the program at a range of international venues (Ellis and Kozak 1999; Ellis et al 2003; Ellis 2012; Ellis 2015; Jahan 2015; Ellis 2017).

CONCLUSIONS

By nearly all measures normally applied to undergraduate programs, the WPP program has

been very successful. Over the last quarter century since its initiation, enrollment in the program has grown to meet our original target. Transfer programs established with Chinese forestry universities have driven program enrollment over the most recent decade. Industry engagement with the program has remained very high with consistent hiring of and high levels of satisfaction with co-op students while in the program and graduates on completion of the program. The program and its curriculum content continue to evolve in the ever-changing world of wood products and the education of students best positioned to meet the challenges of tomorrow.

ACKNOWLEDGMENTS

Although the author has had the great pleasure in serving as the program director of the Wood Products Processing Program essentially since its inception (except for a couple of short breaks while serving in a different administrative position and while on a brief study leave), the establishment, development and operation of the program have truly been the results of a tremendous team effort. The utmost recognition and thanks are given for the vision and labor of the late Dr. Thomas Maness (the founding director of the Centre for Advanced Wood Processing) in bringing the program into life. The support of Dr. Clark Binkley (dean of the Faculty of Forestry at the time of the establishment of the program) and the late Dr. J. David Barrett (Wood Science department head at the same time) was also instrumental in the establishment of the program. Many members of the Department of Wood Science have contributed over the last quarter century, but the dedication and support of Dr. David Cohen and Dr. Rob Kozak have been particularly noteworthy. Thanks are also due to all of the technical staff who have contributed greatly to the development and teaching of the courses in the program and to the professional staff who have built our co-op program and other student services. Finally, thanks also go to all our students who make coming to work every day such a great experience.

REFERENCES

- Barrett JD, Cohen DH (1996) The Canadian strategy for renewal and growth. *Forest Prod J* 46(9):15-20.
- Binder K (1993) Determination of the demand for wood processing engineers. Description of a wood processing study program. Report for the Canadian Educational Initiative of the Woodworking Industry, Rosenheim Consult. 55 pp. Unpublished report.
- Cohen D, Maness T (1995) Educational needs of the Canadian solid wood products industry. *Wood Fiber Sci* 27(2):126-133.
- Ellis S (2012) Enhancing student-employer-university engagement through undergraduate co-operative education programs in the UBC Faculty of Forestry. International Partnership for Forestry Education, 3rd Symposium, October 9-12, 2012, Joensuu, Finland.
- Ellis S (2015) UBC co-op program and its implementation. International Symposium on Practice-Oriented Education, Okayama University, March 19, 2015, Okayama, Japan.
- Ellis S (2017) UBC Wood Products Processing program - past, present and future. Forest Products Society 71st International Convention, June 2017, Starkville, MI.
- Ellis S, Evans P, Kozak R (2003) National recruiting initiative educational needs survey. Wood Manufacturers Council, Human Resources Conference, February 27, 2003, Kitchener, ON.
- Ellis S, Kozak R (1999) A new model for undergraduate wood processing education – the B.Sc. in Wood Products Processing at the University of British Columbia. Pages 270-274 in Proceedings, Fourth International Conference on the Development of Wood Science, Wood Technology and Forestry, Forest Products Research Centre/University of Sopron, July 14-16, 1999, High Wycombe, England.
- Evans PD, Macdonald I, Rypstra T, Mortimer J, Wessels CB, Muller R, Muller B, Louw J (2010) South Africa's wood processing industry education strategy: A north south partnership to develop a globally competitive workforce for the 21st century. *Int Wood Prod J* 1(1):48-56.
- Jahan S (2015) UBC co-op program – looking into the program and the hiring process. International Symposium on Practice-Oriented Education, Okayama University, March 19, 2015, Okayama, Japan.
- Smith RL, Bush RJ, Hammett AL (1998) Evaluating the subject need for wood science and forest products curricula. *Wood Fiber Sci* 30(1):105-112.
- Smith RL, Valverde PF (2019) The current and future state of wood science education in the United States. *Wood Fiber Sci* 51(2):221-230.
- The University of British Columbia (1994) Advanced Wood Products Processing Centre. A Proposal from the University of British Columbia to the Board of the National Education Initiative. Unpublished proposal.
- The University of British Columbia (2019) https://www.ubc.ca/_assets/pdf/UBC_Overview_Facts_2018-2019.pdf.