COURSE DEVELOPMENT MODEL: FOR ADULT EDUCATION

BRENT SEELEY

Diploma, Environmental Science, LCC, 1981
Diploma, Forest Technology, NAIT, 1984
B.S. For., University of Alberta, 1987

A Project Submitted
to the School of Graduate Studies
of the University of Lethbridge
in Partial Fulfillment of the
Requirements for the Degree

MASTER OF EDUCATION

LETHBRIDGE, ALBERTA

February, 2004

DEDICATION

This work is dedicated to my wife
Sheila Seeley, and my two wonderful kids
Eric, and Nicole . . . "thanks for your patience—family is
truly the best value in life."

"Looks like we made it!"

Special thanks to Dr. Nola Aitken and Dr. George Bedard for their encouragement and support throughout this process - Thank you.

ABSTRACT

New course development can be a very time consuming process, potentially confounded by ambiguity, misdirection, and a lack of clear focus. What components of existing new course development models can be synthesized to construct a model that is efficient, clear, and concise that promotes successful student learning while fostering the dynamic, self-directed nature of adult learning? Although the new course development model presented here has been developed specifically with adult learners in mind, it may be adapted to new course development for any type of learner. The main concept of this model is to develop clear, concise learning outcomes first, and to design learning assessment activities that reflect the same degree of priority as emphasized in the learning outcomes before the course content is actually constructed. This provides the necessary focus to proceed with the development of course content. These prioritized learning outcomes and assessment mechanisms clearly focus on what the teacher wants the student to learn in the course. These learning outcomes must be identified early in the course and remain unchanged for the duration of the course as learners cannot be expected to hit a moving target. Further, a teacher may evaluate the distribution of assessment mechanisms and cognitive domains tested relative to the prioritized learning outcomes through the use of the course assessment matrix—an organizational tool used to assess develop and retain course focus in a pragmatic way. Effective teaching starts with a clear idea of the end in mind where student success is the ultimate goal.

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Introduction

The Challenge

The challenge, I find in teaching at the college level, is to develop and deliver courses for adult learners that are efficient, effective and most importantly on target. Without clear direction and focus, a lot of time and effort can be spent working in the wrong direction—developing and assessing content that is not necessarily related to the most important objective(s) or learning outcomes of the course. Let's face it, we are often working under time pressure to develop new courses. I have worked at Lethbridge Community College as an instructor for seven years now and I have developed and delivered a number of new courses and I have been involved in new program planning and development which means more changes are coming. Change seems to be the only constant, this being the case, teachers need a clear and concise process model to help them design and deliver new courses efficiently and effectively.

Lethbridge Community College (LCC) is an adult learning institution that offers a broad range of programs. The focus of the institution is to promote quality, life-long learning opportunities for adult learners. The college hires instructors based on specialized knowledge and experience which promotes a strong connection with the community and associated businesses and industries while promoting relevant expertise within program areas. New instructors, although very knowledgeable in their areas of specialization, may lack teaching experience and the specific skills necessary to develop and deliver courses. This is not a criticism, rather it is an observation; on one hand, field expertise is required for relevant course content; on the other hand, the ability to teach

that content is equally if not more important and may be lacking. Field professionals who move into a teaching role must learn how to teach. Often this is "on-the-job-training" and involves a lot of trial and error. Is it better to hire formally trained teachers and teach them course content?; or, is it better to hire content experts and teach them how to teach? In the end, both skill sets are required in the classroom—effectively two professions rolled into one individual. I definitely support the idea of trained field expertise being hired into the program. These professions bring technical experience, relevance, and compassion to the classroom. They bring first-hand experience to the student who shares an interest in where the instructor has been. This creates a very powerful motivation for the students and generates a lot learning intensity in the classroom that usually follows you to your office. This being the case, new instructors must draw from their own educational experience and learn very quickly how to develop and deliver course content such that it provides a high quality learning experience for the students.

Further to my particular working context, I teach adult learners who tend to have a higher amount of life experience than younger students, or grade school students and therefore a higher degree of expectation in relation to their learning because of its direct relevance to their workplace. To me, this means that adults are motivated to be in the program and will work hard on their learning, but they are also, in some sense, critical of what is being taught.

My situation is similar to that of many other adult educators who effectively wear at least two hats. I am a professional forester, with 10 years of forestry experience, and I have been teaching forestry-related classes in the environmental science program at LCC

for the past seven years. When I first arrived as a new instructor, without any formal training in education, there seemed to be little to go on when I began developing my first courses. I attended a one-week "Instructional Skills Workshop," where I learned the basics of lesson planning, presentation, and the use of various audio/visual equipment. I had binders of course content from previous instructors, however sketchy they were. My first instinct was to focus on the course content that was left for me. As I began developing my first courses, I soon realized that I can not put myself behind someone else's thinking (i.e., someone else's course content), so I had to build my own content based on where I thought the course should go and where previous instructors had taken the course. Having virtually no teaching experience, I focused heavily on course content and put together exams and assignments at the last minute based on what we had covered in the course to that point. I was thinking of the course as content knowledge rather than student learning. I realize now that I was delivering course content with no real focus and limited application of knowledge. I was dumping information on them without challenging them to learn it or to apply it. I also found that I seemed to be doing all the work while the students sat back to watch the show. *"So, how long do you think he can keep this up?"* I soon began to burn out—there's no way this should be so hard, *"what am I missing?"* I was literally developing and delivering course material simultaneously. This was a tough experience, one that nearly sent me back to the woods talking both to myself and the trees. What was I missing? Well, likely a few things, but the main thing I was missing was clear direction as to what to focus the course content on (as I look back on my first course outline there is not one learning outcome on it). Since this experience,

I have often wondered what could be done to make this process of developing and delivering a new course more efficient and effective. I gave in to the idea that I need to become a teacher not just a content expert. This has lead me to further my education in education and this project is the fruition of that effort.

As previously mentioned, change is constant and time is often a limiting factor in new course development and that reinforces the importance of a concise and efficient process model that is easy to use. All teachers are expected to be knowledgeable in their areas of specialization, but how does an inexperienced teacher begin? What should be the focal points for the course? Are they all the same or are some things more important than others? What is an appropriate amount of course content? How is the course content best delivered? What are reasonable expectations in terms of student learning? Do the students know clearly what is expected of them? Are the course outcomes clear and are they being met? What exactly are course outcomes? Is the evaluation of student learning fair? How does the instructor know if quality learning is happening for the students? What is quality learning? How do you know when you have arrived? What tools are available that allow the teacher to know if the most important aspects of the course are being grasped by the students, and are these being fairly evaluated by the instructor? Today, given seven years teaching experience and a nearly complete Master's Degree in Education, these and many other questions play through my mind as I consider developing a new course. As I first began as an instructor seven years ago I didn't even know what the questions were, let alone the answers—some direction was definitely needed.

Project Description

You may have noticed the cabin on the dedication page. I put it there for a number of reasons. Firstly, I built it and I am very proud of it. More than that however, it provides an excellent analogy with respect to developing a new course. Building a new course efficiently involves a number of sequential steps much like the building a house requires a number of sequential steps. You certainly can't put the roof on until you have walls, and you can't put up walls until you have a good foundation, and so on. There are many things to think about when it comes to building a house and many of these things relate to and are dependent on each other and require the builder's attention in a specific order. Clearly, a builder must be knowledgeable, well organized, efficient, and dependable in order to be successful. Even more important, can you imagine a builder starting a housing project without a plan? (I hope you haven't paid that deposit yet). A builder obviously requires a set of detailed plans which, if followed correctly, will bring the house together in an orderly manner exactly as planned .

Why would building a course be any different? Starting with a good plan will definitely help. Experts in education consistently suggest that it is critical to start with a good idea of the end in mind. What do you want the students to know and/or be able to do upon completion of the course? What things are most important? A good course will require a solid foundation (What is the course about? How does it fit into the program? Does it meet employability criteria?, etc.); it will also requires a solid frame (What are the learning outcomes? What do you want students to be able to do?); it will also require support (instead of septic, water, and electrical systems, a course may need computers,

science labs, and field time); and finally what about a roof? (How will learning be assessed? Did the student really learn what you had intended? How can you be sure?). The amount of time it takes to build a new house will vary depending on the builder's experience and the complexity of the house; similarly, the amount of time it takes to build any new course will depend on the instructor's experience and the type of course being developed. Of course all houses require maintenance over time and so would a new course. It is important to evaluate courses in terms of what is working well and what is not working so well and make the necessary adjustments. *It would not do to have a leaky course.* So now it's time to trade in our carpenter's belt and power tools for a pad of paper and computer; and in the end, it will be interesting to see how building a new course is quite similar to building a new house. The point of this project is to lay out a clear and concise process model (series of steps) by which a teacher would approach the construction of a new house . . . I mean course . . . of course.

In my experience, not all courses are equal with respect to the complexity of development, delivery, maintenance, and assessment of learning. Lecture-based courses —"chalk and talk"— *may* be simpler to develop as they do not involve lab and field components. Other more applied types of courses involving lab, field and/or work-based practicums will require a broader range of learning outcomes and learning assessment techniques. The context within which this project is being conducted is "applied" adult education which involves the practical application of knowledge and skills learned in a field environment.

I am specifically interested in constructing a concise process model for the

development of new adult-education courses that is applicable to a broad range of course types. I am hopeful that this will help new and experienced instructors develop new courses and perhaps evaluate existing courses to promoting well-focused, quality learning for adults. As part of this project, I will apply the process model to the development of one new course I will be teaching next year. This will be an applied course in fire management that will involve lecture, lab, and field components intended to develop knowledge and the application of that knowledge in a field setting. Further, using a course assessment matrix (see Appendix A), I will analyze the course relative to the learning outcomes, types of assessment mechanisms used, and learning domains tested. From this I may adjust the course and its assessment mechanisms as necessary to refocus on those learning outcomes I determined to be the most important. Working through the process model initially, particularly establishing the course assessment matrix, will involve a lot of time, but once complete, will provide a very useful and easy to use tool to maintain and update my courses.

Project Methodology

Action Research

Research is primarily a problem-solving activity (Anderson, 1998). In this case, the problem is "how can an instructor promote well-focused, quality learning in the development of new courses for adult learners that is efficient and effective in terms of promoting student success?" This project is an example of action research. Mills (2000) defines action research as "any systematic inquiry conducted by teacher researchers, principals, school counselors, or other stakeholders in the teaching/learning environment, to gather information about the ways that their particular schools operate, how they teach, and how their students learn" (p. 6). According to Mills, action research done by teachers for teachers is persuasive and relevant in that teachers are invested in the legitimacy and application of their research. This is exactly the point of this project—to develop a useful new course development tool for myself and other instructors with whom I share a similar working context. More specifically, Mills refers to this type of project as "practical" action research where there is more emphasis on the "how-to" and less on the philosophical aspects of the research. Another major aspect of action research, according to Mills, is that it is accessible to other teachers. Again, this is a key part of my interest in this project as I will construct a concise summary (pamphlet) of the course development process model that may be of use to other teachers in a similar working context.

This project involves five steps starting first of all with a literature review to find existing process models for new course development within the context of adult education and applied learning. The second step is to synthesize these findings and

construct a concise process model that is relevant to my professional working context. This process model will be formatted as a flow chart or diagram and will be supported by a clear and concise description of its application. The third and most important step as relates to action research, is the application of this model to the development of a new course that I will be teaching this winter. This will involve the development of a course description and outline, learning outcomes, course content (lecture, lab, and field components), supporting course manual(s), course projects (lab and field), student learning assessment activities, and a course assessment matrix. Following this, step four will involve a critical evaluation of the model and its application in terms of its effectiveness. Part of this will involve a simple quantitative evaluation of the course using the course assessment matrix. This matrix will serve as a summary from which I can evaluate trends to determine whether or not I have the mix of learning opportunities I want in this course. I can also evaluate if these learning opportunities accurately reflect the learning outcome priorities I have established for the course, and to see if the evaluation of student learning is in alignment with the prioritized learning outcomes. From this evaluation, I can adjust course content, test assessment mechanisms, or do both to achieve the desired mix. Finally, I will construct a brief (1 to 2 page) pamphlet version of the model and its application for use by other adult educators. Table 1 provides a summary of the specific action research questions in relation to the above steps outlined for this project. These questions provide the focus and direction needed for this action research project.

Table 1. Action Research Steps and Questions.

Project Purpose: Develop a process model for new course development in an adult learning context.			
	Steps		**Research Questions**
1.	Literature review	1.	In the literature, what process models are identified for new course development within the context of adult education and applied learning?
2.	Develop a synthetical process model	2.	Based on the literature, my needs, preferences, and experiences as an instructor, what elements of existing models may be synthesized to construct a concise process model for application to new course development?
3.	Apply model to one course	3.	What are appropriate strategies for implementation of the model? (Appropriate within the context of the literature and my professional needs.)
4.	Evaluate the model	4a.	What are appropriate criteria for evaluating the effectiveness of the model? (Effective in the sense of time savings while promoting student success.)
		4b.	Based on this evaluation, what changes, if any, should be made to the model?
5.	Follow up and recommendations	5.	How might this model be made useful to other adult educators?

Step 1: Literature Review of Existing Course Development Models

Research Question: In the literature, what process models are identified for new course development within the context of adult education and applied learning?

An integral part of successful student learning comes from the quality of teaching. Angelo and Cross (1993) emphasize that the quality of student learning is directly related, but not restricted to, the quality of teaching. The literature consistently points to a

"backwards - forward" approach or starting with the end in mind when it comes to successful student learning. Wiggins and McTighe (1998) suggest the following stages in the backward design approach to curriculum development: one, identify the desired results (What do I want students to know?), two, determine acceptable evidence of their learning (How will I know if they have learned it?) and three, plan learning experiences and instruction (What will we do to get there?). For learning to be most successful, students must know clearly what is expected of them. To accomplish this, teachers must first clearly identify what they want the students to know and be able to do upon completion of the course. Popham (1995) emphasizes the importance of clear, well-focused learning outcomes that are prioritized as *essential*, *highly desirable,* and *desirable* for the student to know and/or be able to do. This produces the much needed focus for both the teacher and the student. These learning outcomes must be clear, tangible, and measurable in order to be effective. They are prioritized and presented to the students early in the course so they can see clearly what is expected of them. It is critical that these expectations do not change for the student during the delivery of the course. Gronlund (2000) describes a frame of reference that may be used for a teacher to start preparing instructional objectives or outcomes. These are categorized as lower-level cognitive outcomes (knowledge, comprehension, and application); higher-level thinking skills (analysis, synthesis, and evaluation); affective outcomes (attitudes, interest, appreciations); and performance outcomes (procedure, product, and problem solving). Depending on the nature of the course being developed (introductory or advanced), a teacher will have to decide on the type and amount of learning outcomes to be targeted

for each area or level of instruction. According to work done by the Board of Education of Etobicoke (1987), these different levels of thinking have specific "directing words" associated with them to direct the student through a specific learning outcome (see Appendix A). A teacher would apply these directing words in the development of learning outcomes in order to achieve the desired level of thinking.

Once the learning outcomes have been set, the teacher then designs the learning assessment mechanisms and the course content. As the evidence of learning is measured through various types of assessment methods (Popham, 2001), it becomes important for the teacher to develop a broad range of assessment mechanisms. These mechanisms must be reviewed periodically to ensure they are properly aligned with the learning outcomes and that they reflect the same degree of priority shown in the ranking of the course learning outcomes. What to assess is strongly focused on prioritized learning outcomes. Formative assessment, according to Oosterhof (1999) and Gronlund and Cameron (2004), is critical in monitoring student learning progress. Popham, Oosterhof, and Gronlund and Cameron all emphasize the importance of using formative feedback as a mechanism to improve learning, and not just as an opportunity to provide the student with a grade.

Angelo and Cross (1993) identify a number of steps in a classroom assessment project cycle (see Figure 1). This model relates to the evaluation of an existing course from start to finish which also applies neatly to the steps associated with building a new course. What is interesting is that the lessons are designed only once the teachers knows exactly what he/she wants the student to know. This cycle involves three phases: planning (develop learning outcomes and learning assessment mechanisms), implementation

(teaching, feedback, and analysis), and responding (communicate results from feedback and make course improvements).

PLANNING	1	Choose the class for evaluation
	2	Focus on learning outcomes - prioritize them
	3	Develop an assessment mechanisms focused on specific goals or outcomes
IMPLEMENTING	4	Teach target lesson relating to outcomes
	5	Assess student learning (feedback)
	6	Analyze student feedback
RESPONDING	7	Interpret Results - strategy to improve learning
	8	Communicate results with students
	9	Evaluate the effectiveness of assessment used
FOLLOW-UP	10	Design a follow-up project for larger-scale learning assessment (classroom, program, institution)

Figure 1. Classroom assessment model (modified from Angelo and Cross, 1993).

Sparzo (1990) and Gronlund (1998) focus on writing technically correct test items which are consistent with the teacher's learning outcomes. Sparzo provides a brief, five-step review of the common problems in designing test items followed by an in-depth outline of "how-to": prepare content outline, list instructional objectives, appraise student performance levels, design a course blueprint, and finally write test items. Sparzo's approach ensures that the learning assessment mechanisms are strongly centered on the learning objectives and that the students are made aware of this early in the course. Brualdi (1998) takes this idea one step further by incorporating performance-based assessment which goes beyond student recall to test the application of student knowledge. Although this is of importance for all learners, it is of particular importance when dealing

with adult learners in the context of applied learning. The application of knowledge learned in the course and the application of specific skills in the field are higher-order learning experiences which are important in applied adult education.

According to the work of Malcolm Knowles (1980) there are significant differences between adult learners and children. Whereas children tend to be dependent on the teacher and learn content as expected of them, adults are much more discerning. Adult learners have a higher amount of life experience and a higher degree of expectation in relation to their learning. Adults want to apply what they learn to their own experiences. Rather than the pure acquisition of knowledge, adult learners are more performance based, so learning should be based around their experiences (Knowles, 1980). Knowles describes adult learners as experienced, self directed, goal oriented, practical, and relevancy oriented. An adult educator must take this into consideration during the development and delivery of a course, as well as, in the assessment of student learning.

Once a course has been developed it must be maintained and/or improved over time. As any good teacher will know, teaching is not a static process—it must change over time in order to keep up with new information. Knight, Aitken, and Rogerson (2000) refer to this process as "continuous quality improvement" or CQI. Simply the teacher continuously looks for ways of improving the quality of the course. They suggest this is best achieved through a shared process of consultation, discussion, and support with colleagues to promote an integrated learning environment. This is an important idea as the practice of teaching is largely done behind closed doors where connectivity with

other teachers and professions is lacking. More specifically however, how does a teacher know if learning and assessment of learning are well focused on the prioritized learning outcomes for the course? Knight, et al. have developed a course "blueprint" (or course assessment matrix as I have chosen to call it) that may be used to summarize specific test items in relation to prioritized learning outcomes allowing the teacher to see if tests and other learning assessment mechanisms are doing what they are intended to do. This type of assessment tool will allow the teacher to see if test items match the prioritized learning outcomes. With this information, a teacher can redesign or refocus specific test items in order to achieve relevance to learning outcomes and/or achieve specific types and levels of learning. Data can be compared from one year to the next to monitor trends in specific test items or specific assessment methods. In the end, the objective is to move toward higher quality, well-focused learning that is clear to the students, thus promoting student success in the course.

Angelo and Cross (1993), Brualdi (1998), Sparzo (1990), Wiggins and McTighe (1998), Gronlund and Cameron (2004) all concur that clear prioritized learning outcomes establish the basis upon which to proceed with the design of student learning assessment mechanisms and course content.

Step 2: Develop a Synthetical Process Model for New Course Development

Research Question: Based on the literature, my needs, preferences and experiences as an instructor, what elements of existing models may be synthesized to construct a concise process model for application to new course development?

Drawing from the literature, as well as my needs, preferences, and experiences as an instructor, I have synthesized the following process model for new course development (see Figure 2). The major components of this model come from Brualdi (1998) and are supported in concept by Angelo and Cross (1993), Sparzo (1990), Wiggins and McTighe (1998), and Gronlund and Cameron (2004). The model shown in Figure 2 is presented as a flow chart to illustrate the cyclic and adaptive nature of the model. I have divided the model into primary and secondary phases which reflect new course construction (primary phase steps 1 through 7) and course maintenance (secondary phase steps 8 through 10). The initial pass through the primary steps of the process model involves a substantial effort that is heavily focused on the development of prioritized learning outcomes and will result in a well-focused course that is ready for delivery. As all good teachers know, modifications and updates to any course will have to be made and this can be done quickly and easily once the course assessment matrix is in place and by following the secondary steps. Although you may work back and forth between steps, it is important to complete each step in relative sequence. The order of these steps within the process model is what creates the focus and efficiency of the new course development process.

Without the benefit of the model, I think the tendency would be to jump from step 1 to step 4 without clearly identifying and prioritizing the learning outcomes. The following is a brief description of each step:

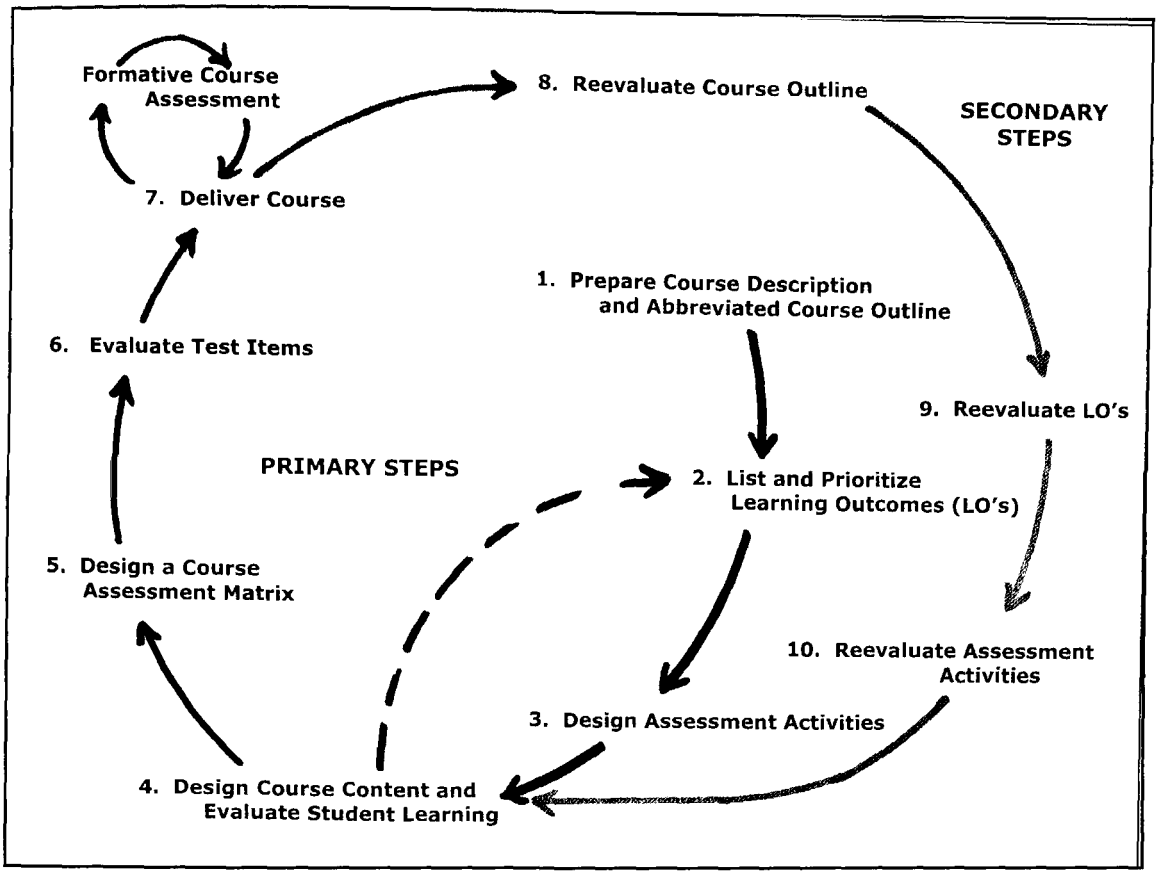

Figure 2. Process model for new course development model.

Primary Steps:

This is the new course development phase of the process model. During this phase the focus is prioritized learning outcomes, learning assessment mechanisms, and course content. Upon completion of this phase, the course is ready for its initial implementation. The quality of the course at this point is a function of the effort put in by the teacher. The working and reworking of outcomes and assessment mechanisms will provide the focus for course content development.

1. **Prepare an initial course description and abbreviated course outline.** This is a step that I have added in. Even though the literature states explicitly to develop

learning outcomes first, I still need to see a bigger picture that identifies the direction and some of the major components of the course. In a broad sense, what is the course about? What are the component parts of the course? What are the main topic areas of the course? These should be identified and listed in a chronological sequence and will become the basis for developing specific learning outcomes. The topics can be broken down into lecture and lab topics and presented as a framework to begin mapping the course. This helps the teacher to establish the scope and depth of the course.

2. **List and prioritize the learning outcomes.** This is the key element to this process and should be done with considerable care and attention. In my experience, this is best done in relation to the course description and broken down between lecture, lab, and field components for the course. These will be written and rewritten until they reflect exactly what the teacher wants the students to get out of the course. It is important to recognize that learning outcomes exist at three levels, these are generic, core, and specialized outcomes. Generic outcomes are the most general and reflect institutional learning objectives. These learning outcomes are something to be achieved by all student in the institution regardless of what program they are in. An example of this at LCC would be . . . "the student will demonstrate the use of mathematics and integrate results into daily affairs and business-related problems." Core outcomes reflect important program level learning objectives. These outcomes may be met by one or more courses within a particular program area. An example of this within the Environmental Science

program at LCC would be . . . "the student will collect and analyze field data relevant to resource management issues." Finally, specialized learning outcomes identify knowledge or skills specific to a given course. For example, one of the specialized learning outcomes in the fire management course I will be teaching will be . . . "the student will demonstrate the proper set up, operation, and care for the Mark III fire pump". According to Gronlund (1998) learning outcomes should be defined based on the cognitive domain they are intended to test. These may then reflect specific knowledge, comprehension, application, analysis, synthesis, or evaluation capacities of student learning. Specialized learning outcomes should be clear, concise, and measurable. These specialized learning outcomes are the focus for new course development. Once these have been determined, it is important to prioritize these. As stated earlier, Popham (1995) prioritizes outcomes as *"essential," "highly desirable,"* and *"desirable"* for the student to know and/or be able to do. It is a good idea to put these into the course outline and review these with the students at the beginning of the course. Again, the key to this entire process is the prioritized learning outcomes. The teacher will then build the learning assessment mechanisms and course content around these prioritized learning outcomes. This provides the necessary focus for both the teacher and the student. When the teacher and the students are moving toward the same clear objectives, successful learning should increase.

3. **Design the assessment activities.** According to Wiggins and McTighe (1998) part of the backward design process requires that the assessment activities be

designed prior to or at least concurrent with the actual lessons. This may be counter intuitive for some teachers who may instinctively jump to course content as I have done in the past. The point that Wiggins and McTighe make is to establish, in advance, the evidence of learning and tailor specific lessons to produce the evidence of that learning. The learning then becomes consistent with the learning outcome(s) and the kind of learning the teacher expects from the student. According to Gronlund (2004), effective assessment requires a clear conception of all learning outcomes, a variety of assessment procedures consistent with the cognitive domain being tested, an adequate sample of tasks, fair in process, clear criteria for judging success, timely and detailed feedback to students, and a fair and consistent grade reporting system. For example, one of the most important learning outcomes for the course that I am currently developing is ". . . for the student to be able to identify and describe the components and interrelationships of fire behaviour." Through the application of this model and some analysis of the assessment mechanisms, I find that this is indeed my top ranked learning outcome and that the cognitive domain challenged is largely comprehension and application—both higher levels of learning consistent with my objects for the course.

4. **Design course content and evaluate student learning.** With a complete and relatively final list of the course learning outcomes and associated assessment mechanisms, the teacher then works on the course content. Working back and forth between the course content, learning outcomes, and assessment mechanisms

will help to promote course focus. In the model, this is shown as a dashed black arrow between step 4 and step 2. You will work between steps 2, 3, and 4 of the model until the course content, learning outcomes, and assessment mechanisms are finalized. A teacher, particularly a new teacher, will need to spend time researching the various types of student learning assessment techniques. How to develop, administer, and score written and/or alternative assessment mechanisms. How to interpret results from the students and how to effect positive changes in terms of learning. Oosterhof (1999) and Brualdi (1998) emphasize a wide range of learning assessment mechanisms to accommodate a wide range of student learning styles. Although this is an important aspect of the primary phase of the model it becomes a major component of the secondary phase of the model also. Once the initial assessment mechanisms have been established, you will move on to step five where the types of assessment mechanisms and the learning domains tested relative to the learning outcomes may be evaluated using the course assessment matrix.

5. **Design a Course Assessment Matrix.** The course assessment matrix is a mechanism that is used to relate specific learning outcomes to the various types of assessment mechanisms used by the teacher (see Appendix B). It provides a quick summary of the course framework allowing the teacher to assess whether or not the assessment of student learning is in alignment with the prioritized learning outcomes. There are any number of different formats which may be used depending on what the teacher wants to assess. The course assessment matrix I

have chosen for this project is adapted from Knight, et al. (2000) and is intended to clearly isolate the relationship between learning assessment mechanism and learning outcomes and to further assess the cognitive learning domain tested with each test item. Summary tables may be designed to show trends of different types. My specific interest at this time is to see if my assessment of student learning is in alignment with the learning outcomes that I have developed and prioritized and to see if I am developing the types of comprehension and application of knowledge that I am hoping for. Remember that the intent of formative evaluation is to promote student success through improved learning and that is the purpose of the course assessment matrix.

6. **Evaluate Test Items.** Do specific test items clearly test the intent of the specific learning outcome? Only the teacher can really make that assessment and it takes time to look at and think about each test item. Does the test item test the appropriate cognitive domain? Has the teacher tested all of the learning outcomes? If not, is the learning outcome really that important? The analysis of the course matrix is very interesting in that it will uncover inconsistencies, errors, over or under emphasis on particular topic areas, and sometimes complete omissions. Seeing this up front and correcting it invariably saves time and frustration in the future delivery of the course for both the teacher and the student.

7. **Deliver Course.** The true test of success will be in the delivery of the course and the evaluation of its progress. An intuitive teachers is constantly "sizing up" what is happening in the classroom. What is working and what is not. We have all felt

that point at which we lost them . . . then again maybe we never had them?!? It is very important at this time that the teacher keep track of and evaluate the success of the course. Teachers should welcome the opportunity for constructive feedback on the course from the students, peers, and supervisors. This will require a course assessment questionnaire to be completed by the students and some sort of bookkeeping system to keep notes during the delivery of the course.

Secondary Steps:

The secondary steps or reevaluation phase of the model provides an adaptive quality to the process model by allowing for course improvements to be made over time. It is important to reevaluate a new course or even an existing one in terms of its individual effectiveness and its fit into the program. Once the course evaluation matrix has been established, a teacher can see quickly where improvements are needed.

8. **Reevaluate Course Outline.** Having delivered the course and after reviewing the course assessment matrix, formative and summative evaluations, and notes made during the delivery of the course, the teacher may then review the course outline and adjusts it to reflect appropriate improvements.

9. **Reevaluate Learning Outcomes.** Review the learning outcomes again to be sure they clearly identify what the student is to get out of course. Some may need to be modified while others may need to added or deleted. Check the priority for each learning outcome and ensure that you have a balance. I feel that about half or two thirds of the learning outcomes should be "highly desirable" or middle category while the others should be balanced between "essential" and "desirable."

The tendency I think is that teachers are convinced that they are all essential. You have likely noticed that courses always seem to build up as new and exciting things are added into the course and very rarely do things come out of the course in order to sustain balance. This is a common trend that I have noticed at least in the program that I teach in. The problem with this is that if every teacher goes this route, the students are soon overloaded and are unable to keep up, motivation drops off, and student success suffers. In other words, balance at the program level is just as important as balance at the course level. Ensure that any changes to the learning outcomes are added to the course outline.

10. **Reevaluate Assessment Activities.** Recall that Oosterhof (1999), Gronlund (1998), and Brualdi (1998) all agree that the assessment of student learning should promote improvements in lesson planning and teaching methodology. Reworking the assessment activities, based on formative feedback from the students, should promote the quality of the learning experience for the students. Once the course is established and running smoothly the teacher can review the process periodically to keep it on track.

Step 3: Application of the Model

Research Question: What are appropriate strategies for implementation of the model? (Appropriate within the context of the literature and my professional needs.)

In order to explore the implementation of this model, I completed a brief pilot study in Educ 5850—Issues in Student Evaluation— taught by Dr. Nola Aitken in the

Master of Education program at the University of Lethbridge, Alberta. Applying what I learned from that course, I reevaluate a course I have been teaching for seven years. In effect, I applied the secondary component or reevaluation phase (steps eight through ten) of the model. This was a very useful exercise in terms of course improvements and it has allowed me to become familiar with the process model.

The full implementation of this project involves the development of a new course I will be teaching in the winter semester of this year (2004). This is a Fire Management course which is part of the Environmental Science program at LCC. It is a five-credit course that involves three hours of lecture, two hours of lab each week, and a two-day field trip at the end of the semester in April. The application of this model will reflect the steps outlined in the process model, and specific products resulting from each step are provided in the appendices.

Step 4: Evaluate the Model

Research Questions: What are appropriate criteria for evaluating the effectiveness of the model? (Effective in the sense of time savings while promoting student success.) Based on this evaluation, what changes, if any, should be made to the model?

Unquestionably there is a major time investment up front in this process. The amount of time invested will vary from one teacher to another and from one course to another. "Not all courses are created equal"—some are considerably more difficult to build and deliver than others. In my opinion, this model would be most useful to someone building a new course from scratch or a major revision of an existing course. In the end,

time and effort will be saved, but it may be very difficult to determine just how much. Certainly, the teacher and students will benefit from the focus and efficiency created through the use of this model.

How does one measure the effectiveness of the process? This will be a subjective interpretation likely to be different from one teacher to another based on the amount of work they invested in the process. As stated earlier, Angelo and Cross (1993) emphasize that the quality of student learning is directly related, but not restricted to, the quality of teaching. This makes sense and leads to the thought that the success of the process could be measured through the success of the students. Test and assignment results can be tracked over time, but who is to say that an "A" is more or less successful than a "B"? Also, if the course does not have a history there is nothing to compare the numbers to. It would be a good idea to track results over time anyway to evaluate trends with respect to exam and assignment results, in fact, individual test questions can be tracked. I feel the best way to evaluate the success of the model is simply to ask the students through formative and summative assessment questionnaires. I have developed and will implement formative and summative questionnaires to obtain feedback from the students relative to the course (see Appendix C). Students have the capacity to evaluate the course delivery, learning assessment, and learning success relative to their own expectations of success. According to Angelo and Cross (1993), group instructional feedback techniques (GIFT) are a critical part in the development of any new course. Simply the teacher needs to understand, "What worked? What did not work? And what can be done to improve the course?" All teachers are subject to periodic evaluations, and in fact I am due for one next term. I have arranged for a class visit of my new course (RRM299) as part of this

evaluation in order to get some feedback from my team leader. It may be in the best interest of a teacher, especially one dealing with a new course, to take this idea further by triangulating course feedback. Triangulation is a process used by astronomers to chart a star's position from three points. Teachers can make use of this concept by triangulating course feedback from three different sources. This would involve the formative and summative feedback from students, peer and/or supervisory classroom visit and assessments, and self reflection on the part of the teacher. The student feedback and classroom visits are easily arranged, but it is equally important for the teacher to keep a reflective journal to keep track of what is working and what is not working in the classroom (see Figure 3). From this, the "reflective practitioner" may set goals, evaluate these goals, and develop new ones, and effectively monitor the development of improvements in the classroom. In addition to keeping a reflective journal, I have designed a brief course assessment critique which may be used to keep track of learning outcomes in relation to student learning assessment mechanisms (see Appendix D).

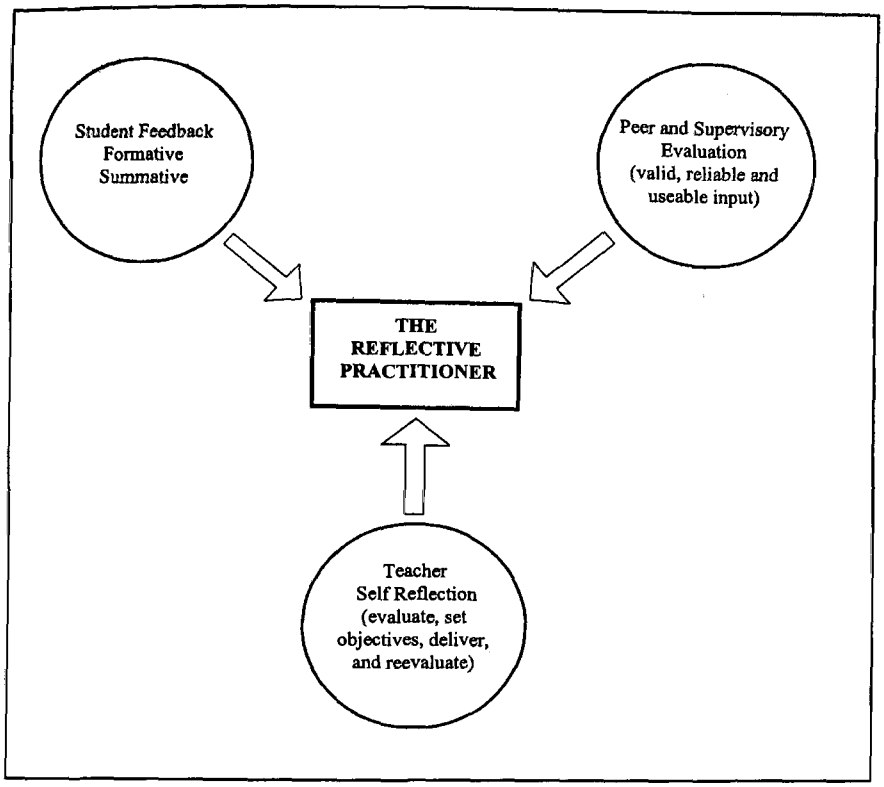

Figure 3. The reflective practitioner.

Step 5: Follow up and Recommendations

Research Question: How might this model be made useful to other adult educators?

One of the main objectives of this project is to produce a concise process model for new course development that is useful to other adult educators. Other adult educators with similar interests may get some use out of an abbreviated description of the process model. I have developed a pamphlet that briefly describes the process model, course assessment matrix, and its application (see Appendix E). I have been asked to present this project to program faculty and the professional development coordinating committee and look forward to doing so.

Project Implementation

The following is a descriptive account of the process involving the application of the process model. This is restricted to the primary steps of the model (steps one through seven). The secondary phase of the model, reevaluation and follow up, will be completed in the future.

Step 1: Prepare Course Description and Abbreviated Course Outline.

I began with a brief course description and list of course topics (see Appendix E). This was done quickly based on what I thought the course should be about. The final course description will get reworked, potentially a number of times, before it is finalized and ready to go into the program calendar. The list of topics areas will establish the basis for the development of learning outcomes which become the focal point of the process from this point on. The list of course topics should reflect a chronology and a degree of priority consistent with the development of the course. From this list of course topics, I framed out a weekly schedule to see how the lecture and lab content would fit into the 16-week semester. This course framework becomes very useful in the development of learning outcomes and course content (see Appendix F). The course outline will be further fleshed out as the course outcomes, course content, and assessment activities have been settled.

Step 2: List and Prioritize Learning Outcomes.

Appendix F provides a list of the prioritized learning outcomes relative to the lecture, lab, and field components of the course. This is a critical and difficult process especially when building a course from scratch. I found that I had to work and rework this

list several times, and it will likely be reworked again based on my experience delivering the course. It is also important to remember that it is incumbent upon teachers to remain current with their areas of specialization, meaning that new information built into the process has to be done in a thoughtful and balanced manner. Hence again the cyclic nature of the model and the concept of the reflective practitioner. However, at this point the list of learning outcomes generated to date becomes the focus of my attention in terms of building course content and student-learning assessment mechanisms. This list of learning outcomes is largely chronological. This makes sense to me as it supports the development of the course in a logical manner. The outcomes are then prioritized based on my interpretation of essential, highly desirable, and desirable for the students to know. I feel it is important to have some degree of balance in this part of the process. There is a tendency to say that all the learning outcomes are essential—that's why they are there. In my experience, I tried to place approximately half to two-thirds of the outcomes as highly desirable (middle category) and divide the last third equally between essential (high category) and desirable (lower category). This is my interpretation of balance, I would expect other teachers to have different ideas on this.

With the learning outcomes established (first cut anyway), the course outline can be completed (see Appendix H), but don't send it to the printers yet!—it is very likely to change as the process unfolds. The course outline at this point establishes the basis to move ahead with steps 3 and 4 of the process model—the design of course content and assessment activities.

Step 3: Design Assessment Activities.

According to Wiggins and McTighe (1998), assessment activities should be

considered before the course content is developed. Establish the acceptable evidence of learning with respect to specific learning outcomes. The intent of this is to focus on the outcomes—measure the outcomes. After all, this is what the teacher has deemed to be the most important, and logically the assessment of learning should have the same degree of priority as shown in the learning outcomes. The model I have synthesized shows an interaction between the development of student assessment activities and the actual development of course content occurring simultaneously. This to me is logical as I can see more clearly how the course content is developing in relation to the outcomes, and support the importance of each learning outcome with an appropriate learning assessment. This has to be a dynamic and adaptive process, as individual teachers, we will all find our own balance in the use of a model such as this. The main thing is not to jump ahead to course content before you know what the learning outcomes are and how you would assess student learning of those outcomes. I found myself working between the learning outcomes, assessment activities, and course content (which is shown as a dashed line in the process model) for several weeks. This is the course development and learning assessment component of the model that will finally begin to bring the course to life. I spent hours building presentations and did my best to ensure that the content was supportive of the learning outcomes and that the amount and priority of the content was consistent with the learning outcomes. Even at this point, I went back more than a few times to readjust the learning outcomes. Realistically, you can't expect the list of learning outcomes to be perfect at any point so be prepared modify and adapt as you go. The same is also true about building that house or cabin. Even the best laid plans will miss something or need to be modified in some way. *If you are too stringent and inflexible this*

process is going to be painful for you! My advice would be to set up as best possible with all the good planning and structure inherent in the model, then allow yourself to be flexible through the process. Enjoy it. It is very satisfying to have ducks in a row.

Appendix I contains a listing of all of the student learning assessment activities such as assignments, course exams, and lab and field projects that I will use in this course. This is a large amount of work that will have you thinking about learning outcomes, how to assess those outcomes, and course content information in support of those outcomes, as well as, content design and delivery. It is very important to be realistic at this point—you can go too far in terms of content volume and student work expectations. This is where experience comes in. You will need to think about the amount and type of work you expect of the students, as well as, think about work loading and expectations in the other courses the students will be taking at the same time. Again, it is important to be realistic—we all like to think our course(s) are the most important and that the student should be heavily focused on these. I try to balance the work expectations with a one-to-one ratio. In other words, if I spend five hours per week with the students I feel they should spend an additional five hours that same week completing assignments and keeping up with course content—this should be enough time to grasp all aspects of the course allowing the student the opportunity to produce reasonably high grades. Further, it is important for you to test your tests and assignments. Make sure they are clear, concise, on-target, and reasonable. This is important, I find it easy to overdo it as I sit in front of my computer—remember that you will have to implement these assignments, tests, and projects, so be realistic. According to Lien (1976), "a good measuring instrument is one that measures what it is supposed to measure, consistently,

with a minimum expenditure of time, energy and money." These learning assessment mechanisms can and will be adjusted later based on what you learn through formative and summative evaluations. This is why the model is cyclic in nature. The management of complex processes tend to be cyclic and adaptive. In other words, learn as you go and adjust as necessary. This model accounts for this as it is intended to focus the effort of new course development up front resulting in a clear, well-focused course that provides a higher quality learning experience for the student. It will also reduce the amount of large-scale adjustments the teacher has to make while allowing minor adjustments to be made easily.

Step 4: Design Course Content and Evaluate Student Learning.

Appendix J provides a list of course content items including: course presentations, course manuals, lab and field projects, and assignments. I have not included the actual presentations or manuals here as these are too large and are not the focus of this process anyway. Interesting to think that course content is not the focus of new course development, yet that is the point of this project. Remember that course content is designed to support the learning outcomes based on the priority you have decided upon and that learning assessment is to be consistent with those prioritized learning outcomes. Course content will become the main priority once you have established the frame or focus of the course. You must start with a good idea of the end in mind.

Step 5: Design a Course Assessment Matrix.

The course assessment matrix, which I have adapted from (Knight, et al., 2000) has been used to analyze student assessment mechanisms relative to the prioritized

learning outcomes (see Appendix K). This has allowed me to determine if my assessment mechanisms are, in fact, in alignment with the prioritized learning outcomes. Down the centre of the spreadsheet, I have listed, in chronological order, the learning outcomes and indicated their priority based on my interpretation of essential, highly desirable, and desirable. To the right of these, I have tabulated the types of assessment mechanisms I have used to assess the learning of these outcomes. By entering each question from my exams under the appropriate assessment mechanism type in relation to the outcome being assessed, I can summarize the amount of assessment relative to each learning outcome. This measurement allows me to see if the assessment of a particular learning outcome is in alignment with its priority. From this I may adjust the learning outcome, its priority, and/or the assessment mechanisms for that outcome. This is the first major filter in the process and proper adjustments at this point will help to focus the course. Further, I can summarize and rank the learning outcomes and the types of assessment mechanisms. This will provide an indication of the types of assessment mechanisms a teacher prefers to use—sometimes too much. Popham (2001) states that a wide range of assessment types should be employed for best results. I agree with this as my own experience would suggest that different students are good at different things. Particularly, in a program such as Environmental Science, where much of the learning activity is lab and field based. On the left side of the course assessment matrix, I have tabulated the assessment mechanisms relative to the knowledge domains being tested. These include psychomotor, knowledge, comprehension, and application. It is interesting to see, by percent, the various knowledge domains being tested. To quantify the knowledge domain tested in this way is an over simplification of the learning process, but at the same time, it provides the teacher with a

reasonable gauge to target higher learning levels particularly with respect to adult learning.

Step 6: Evaluate Test Items.

Once test items are constructed, a significant amount of time is involved installing each test item into the course assessment matrix. The matrix can be modified, adapted, and summarized to show what each teacher may believe to be the most important. Individual matrices can be constructed for each test of a course for independent evaluations. I have produced three separate course matrices and three summaries based on lecture, lab, and field components of the course (see Appendix K). Each test item is placed in the matrix relative to the type of test item it is and the specific learning outcome it is designed to test. As this is being done, I also placed the percent weighting of that specific question in the appropriate knowledge domain category. With the data entered, I compiled the results. Figure 4 provides a ranking of the types of assessment mechanisms I used.

Assessment Types >>>	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Lecture	3	4	1	2	5	6				
Lab	1	4		3		4	2			
Field									2	1

Figure 4. Ranking of learning assessment types.

Assessment Types:

1. Identify
2. Define
3. Describe
4. True/False or Multiple choice
5. Short Answer
6. Essay
7. Measure
8. Calculate
9. Participate
10. Demonstrate

Figure 4 shows a wide range of learning assessment activities and test questions. It indicates how often these question types are used, but does not show the relative weighting of each. For example, short answer, description, and essay questions have a higher relative value on tests then do true-false and multiple-choice questions. Both are valid question forms when used in the right way. Figure 5 provides a summary of the knowledge domains tested prorated against the relative value of each assessment mechanism used in the course.

Assessment Mechanism	Course Weighting	Knowledge		Comprehension		Application	
Lecture Exams	.6	45	**27**	55	**33**	0	**0**
Lab Exam	.2	74	**14.8**	2	**0.4**	24	**4.8**
Lab Assign.	.1	0	**0**	0	**0**	100	**10**
Field Projects	.1	20	**2**	30	**3**	50	**5**
Average		34.75	**43.8**	21.75	**36.4**	43.50	**19.8**

Figure 5. Summary of cognitive domains tested by percent.

The average values in bold refers to the cognitive domain tested relative to the course weighting of each assessment mechanism. The knowledge domain is tested 43.8% of the time while comprehension and application are tested 36.4% and 19.8% respectively. The total of these three values equals 100%, accounting for the total learning assessment of the course. Intuitively, these numbers make sense to me as a student would have to gather a substantial amount of knowledge before comprehension and application of that knowledge could occur. Particularly in an introductory course. A senior level course would have a higher degree of application and could involve more synthesis and evaluation.

Figure 6 itemizes the total learning assessment by percent relative to each learning outcome for each component of the course. The total for each category of learning outcome clearly shows that the emphasis of learning assessment is placed on the essential and highly desirable learning outcomes. From this summary, I can see what areas need to be rethought. For example, if a zero is found in the essential learning outcome category, meaning that there is no assessment associated with it, then I must review the learning outcome and/or its assessment and rework or delete the learning outcome if it is not essential. Figure 7 is a summary of the data from Figure 6 and is depicted graphically in Figure 8.

Lecture Learning Outcomes					
Essential	% of total learning	Highly Desirable	% of total learning	Desirable	% of total learning
1	3.750	3	6.875	9	0.000
2	9.375	4	6.875	10	0.000
5	2.500	7	1.875	16	3.125
6	3.125	12	3.750	17	0.000
8	3.750	13	5.000	19	2.500
11	15.625	22	3.750	20	3.125
14	1.875	23	1.875	21	1.875
15	6.875	24	1.875	25	1.875
18	2.500		**31.875**	26	0.000
27	6.250				**12.500**
	55.625				
Lab Learning Outcomes					
Essential	% of total learning	Highly Desirable	% of total learning	Desirable	% of total learning
5	21.800	2	13.100	1	4.500
8	0.000	4	2.500	3	0.000
9	5.000	6	8.650	17	3.000
16	2.000	7	2.500		**7.500**
18	12.150	10	2.000		
	40.950	11	0.000		
		12	1.000		
		13	9.150		
		14	7.150		
		15	5.500		
			51.550		
Field Learning Outcomes					
Essential	% of total learning	Highly Desirable	% of total learning	Desirable	% of total learning
1	NA	2	6.667	6	0.000
5	13.333	3	6.667		**0.000**
7	16.667	4	6.667		
9	33.333	8	16.667		
	63.333		**36.668**		

Figure 6. Percent of total learning assessment relative to specific learning outcomes.

	Essential	Highly Desirable	Desirable
Lecture	55.625	31.875	12.500
Lab	40.950	51.550	7.500
Field	63.333	36.668	0.000

Figure 7. Learning assessment totals relative to learning outcome categories.

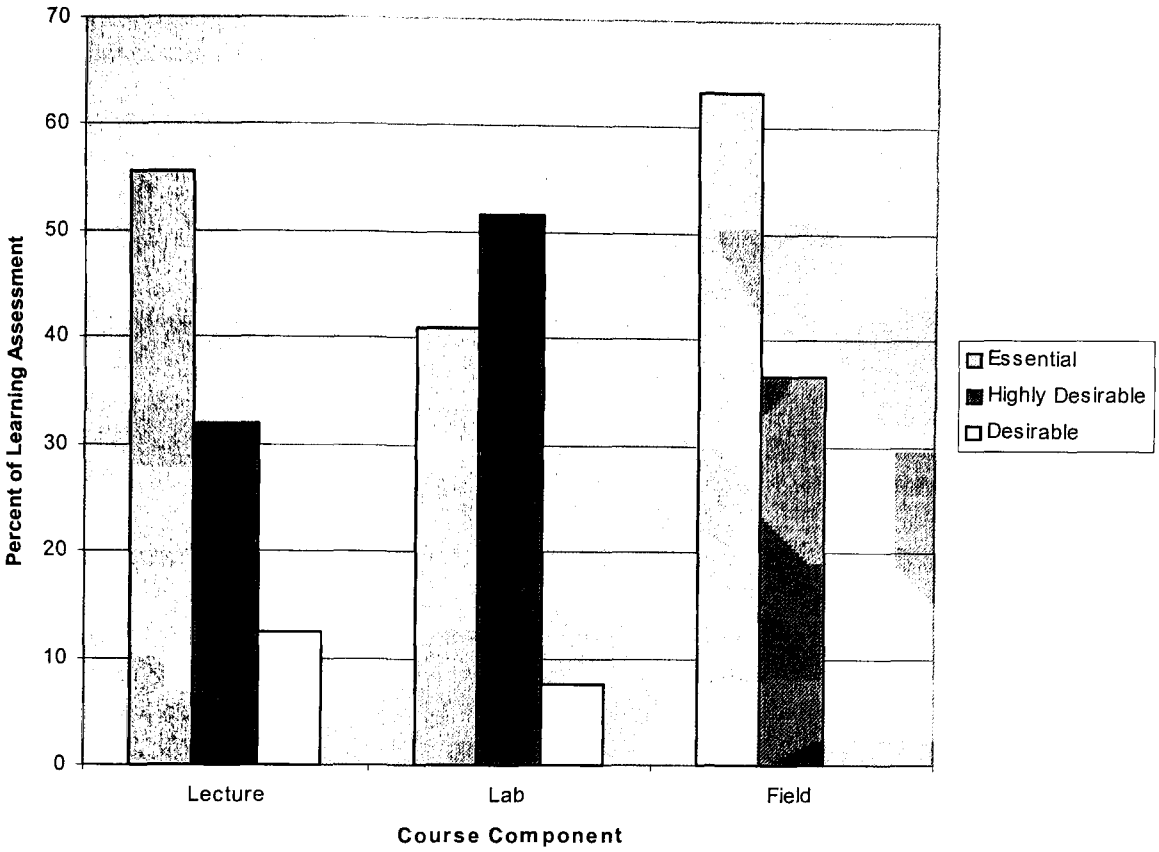

Figure 8. Learning assessment relative to learning outcomes for each component of the course.

The next step in this project is to modify test items and performance rubrics in order to focus teaching and improve learning. I have reworked a number of specific test items and learning outcomes to reflect the above analysis.

Step 7: Stand and Deliver the Course.

Upon completion of the initial pass through the model the course is now ready for elivery. Even with all of the work done up to this point there will be some aspects of the course that do not deliver well. It is critical teachers remains flexible, adaptive, and be able to think on their feet during the delivery phase. The "reflective practitioner" will keep a journal of what is and is not working well. It is important to welcome feedback.

Although we tend to be vulnerable and somewhat defensive at this point, teachers must look at feedback from all sources as an opportunity to make improvements.

Conclusion

Knowledge is constructed and learning is a process much like a building a house is constructed through a number of processes. A teacher must establish a good plan to begin with, and the process model described in this report is one way of establishing that plan. Students involved in the course must be well informed of the plan. It is only fair that the students know exactly how the course will develop and what is expected of them. The literature consistently emphasizes the importance for teachers to clearly identify what it is they want the students to know up front and not to stray from that commitment. Similarly, it is not a good idea to change plans as your building project is in process—you can't just move the kitchen at the last minute. However, this is not say that the process of new course development and course delivery should be particularly rigid and inflexible; teaching and learning is a very dynamic process and it must therefore be adaptive. Any changes or modifications to the course should remain within the context of the plan and everyone needs to be informed. Again, formative and summative evaluations will help a teacher know where changes and improvements are to be made.

Consistently, authors have identified the importance of prioritizing these learning outcomes and designing both teaching and assessment items to reflect these priorities. This definitely strikes a chord with me as I have had well-structured courses with very clear targets and I have had others where I had no idea of where the course was going.

In the end, I find that constructing a new course for adult learners involves a series of orderly steps in much the same way as building a house requires a series of orderly steps. I have found this process model to be particularly valuable as I have used it to develop two courses this year and I will likely need it again next year. Although there is a major investment of time and effort up front, there is tremendous value in following a well laid out plan. The process is cyclic and inherently adaptive, allowing the teacher to follow up efficiently with well focused improvements as the course is delivered again and again. As I have worked through this process, I have learned a lot about the quality, focus, and fairness of my assessment of student learning relative the courses I teach. I am pleased with the results of this process so far and I look forward to seeing improvements in student learning.

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Appendix A

Directing Words for Different Levels of Thinking

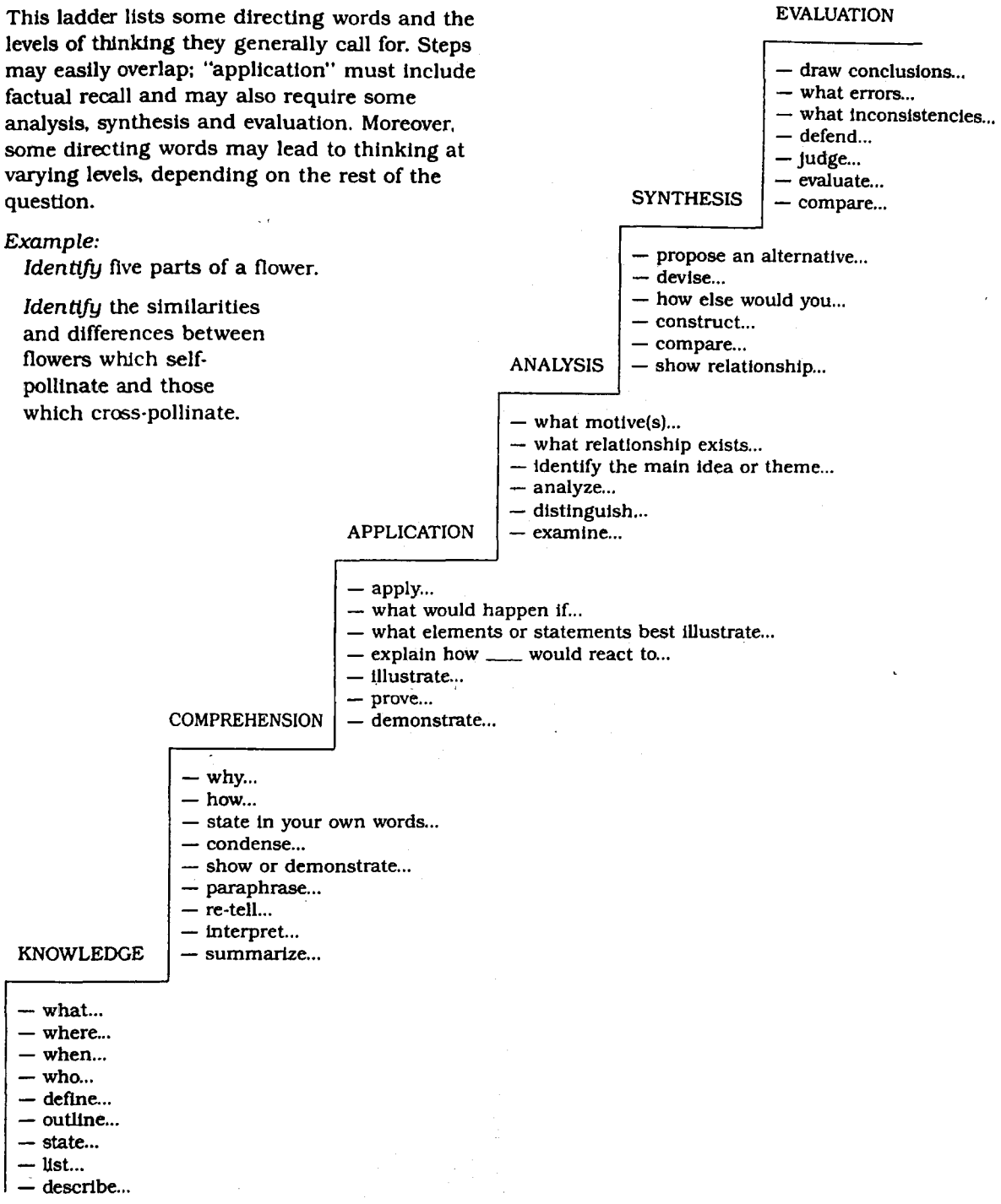
Examples of the Use of Directing Words Appropriate to the Different Levels of Thinking

This ladder lists some directing words and the levels of thinking they generally call for. Steps may easily overlap; "application" must include factual recall and may also require some analysis, synthesis and evaluation. Moreover, some directing words may lead to thinking at varying levels, depending on the rest of the question.

Example:

Identify five parts of a flower.

Identify the similarities and differences between flowers which self-pollinate and those which cross-pollinate.



Appendix B

Course Assessment Matrix - Template

Course Assessment Matrix **Course:** **Date:**

Cognitive Domain (% of test)				Prioritized Learning Outcomes (OC)					Types of Assessment					
	Knowledge	Comprehension	Application	OC - Rank	OC	E	HD	D						
					1									
					2									
					3									
					4									
					5									
					6									
					7									
					8									
					9									
					10									
					11									
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					18									
					19									
					20									
					21									
					22									
					23									
					24									
					25									
					Assessment Ranking:									

Course Assessment Mechanisms:

Appendix C

Course Assessment Questionnaires

Centre for Applied Arts and Sciences
Environmental Science Program
RRM 299 - Fire Management Course
Formative (Midterm) Course Assessment Questionnaire

As this is a new course, I would appreciate your input regarding your learning experience. Your responses and comments are valuable both to me as I develop and improve this course. Please take a few minutes of your time to evaluate this course.

1. The course outline

The course outline and schedule provide a good understanding of where we are going in this course.

Yes No Maybe Comments:

2. Course manual

Is the course manual and lab supplement useful to you?

Yes No Maybe Comments:

3. Making connection

Are you understanding the course material and do you feel it will have application for you in the future?

Yes No Maybe Comments:

4. Course pace

The pace of the class is about right most of the time.

Yes No Maybe Comments:

5. Student engagement

Are you engaged (staying awake) and interested in the class most of the time?

Yes No Maybe Comments:

6. Future

Tell me what I should stop, start, or continue to do.

Stop _____
Start _____
Continue _____

LETHBRIDGE COMMUNITY COLLEGE

Centre for Applied Arts and Sciences

Environmental Science Program

RRM 299 - Fire Management Course

Summative (Final) Course Assessment Questionnaire

As this is a new course, I would appreciate your input regarding your learning experience. Your responses and comments are valuable both to the instructor and the institution. Please take a few minutes of your time to evaluate this course. Your responses will be kept confidential and your anonymity is guaranteed. Your instructor will only see the compiled information which will be used to make improvements to the course.

Please check the appropriate response for each of the following questions.

1 = excellent, 2 = good, 3 = average, 4 = poor		1	2	3	4
1.	Were the learning outcomes made clear to you?				
2.	Did the course follow a logical progression?				
3.	Were classes well organized and effective?				
4.	Did course assignments relate closely to course content?				
5.	Was your learning graded fairly?				
6.	Did the test questions and assignments relate clearly to the learning outcomes?				
7.	Did the value or weighting of assignments and test questions reflect the same priority as did the learning outcomes				

8. What did you like most about this course?

9. What did you like least about this course?

10. What would suggest to improve this course?

11. Any additional comments?

Appendix D

Course Assessment Critique

RRM 299 Fire Management - **Course Assessment Critique**

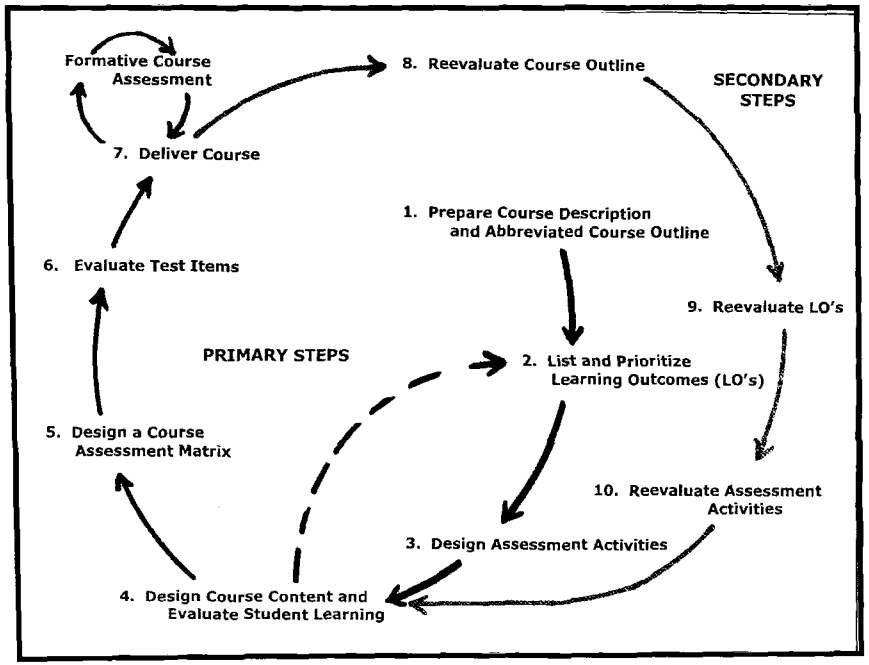
Mechanism	**LO's Addressed**	**LO's Lacking**	**Comments to Improve**
Lecture Midterm (30%)			
Assignment 1 (10%)			
Assignment 2			
Assignment 3			
Assignment 4			
Assignment 5			
Assignment 6			
Assignment 7			
Lab Exam (20%)			
Lecture Final (30%)			
Field Project 1 (10%)			
Field Project 2			
Field Project 3			

Appendix E

Pamphlet - New Course Development Model

New Course Development Model . . . for Adult Education

Developing a new course for adult learners is a major undertaking and can at times be very difficult, stressful, and confusing for both the teacher and the learner. What can be done to streamline and focus the process? How can the teacher ensure that student learning and learning assessment is focused on the most important aspects of the course? The following process model and associated description outlines the steps you could take to develop a new course which will speed up the process, promote efficiency, increase focus on the most important aspects of the course, and promote a higher degree of learner success in the process. Initially, this is a time consuming process, but once completed the course is easily maintained and/or modified. An example of the "Course Assessment Matrix" is located on the back. Give this a try - good luck!



Process Model for New Course Development

1. **Prepare the Course Description and Abbreviated Course Outline:** Write a one paragraph description of the course. In a broad sense, what is the course about? How will it be structured? Write a brief course outline - list the course topics in chronological order.

2. **List and Prioritize Learning Outcomes for the Course:** This is the key element to this process. What do you want the students to learn? Which learning outcomes are essential, highly desirable or desirable?—prioritize them. Relate these outcomes to the course description and modify the course description to align with the learning outcomes.

3. **Design Assessment Activities:** How will you measure learning relative to the learning outcomes. Design the assessment activities to reflect the type of learning you are trying to attain and promote a variety of assessment methods. Learning assessment should reflect the same degree of priority as shown in the learning outcomes.

4. **Design Course Content and Evaluate Student Learning:** Develop course content around the prioritized learning outcomes. Relate the course content to the assessment activities you have chosen and evaluate student learning.

DON'T STOP NOW !! How do you know if you are achieving the type and depth of learning you were hoping for? How do you know that your assessment of student learning is aligned with your learning outcomes?

5. **Design a Course Assessment Matrix:** Using the course assessment matrix provided on back, summarize assessment activities in relation to the prioritized learning outcomes and analyze wether or not your assessment of learning actually does align with the prioritized learning outcomes.

6. **Evaluate Test Items:** Do specific test items clearly test the intent of the learning outcome? And does it test the appropriate knowledge domain (psychomotor, knowledge, comprehension, application)? Has the teacher tested all of the learning outcomes? If not, is the learning outcome really that important?

7, 8, 9 **Reevaluate Course Outline, Learning Outcomes, and Assessment Activities:** This is a cyclic process intended to streamline and focus new course development; as well as, evaluate and update existing courses. Based on your analysis from the course assessment matrix, rework the course content, learning outcomes and/or assessment activities to promote alignment.

Appendix F

Initial Course Description and Course Topics

Initial Course Description

This course involves the study of wildfire management. More specifically, this course deals with aspects of fire weather, fire Behaviour, wildfire control, fire ecology, and the use of fire as a prescriptive management tool. This course has a lecture, lab, and field components, which are linked together to provide a range of learning opportunities for the student. The lecture component provides, theory and concept which backgrounds the application of field and lab work emphasizing hands-on experience and the practical application of knowledge gained in the course.

Course Topics

Fire Weather:

1. Atmospheric properties
2. Clouds and Fire Weather
3. Fire Weather Stations
4. Fire Weather and Fuel Moisture
5. Fire Weather Index System
6. Fire Weather Forecasting and Analysis

Fire Behaviour:

7. Principles of Combustion
8. Fire Triangle
9. Fire Behaviour
10. Forest Fuel Types
11. Assessing the Fire Environment

Wildfire Control:

12. Fire Control Planning
13. Wildland/Urban Interface and "Fire Smart"
14. Fireline Safety and Communication
15. Fireline Organization
16. Fireline Equipment
17. Initial Fire Assessment
18. Methods of Wildfire Attack
19. Stages of Wildfire Control
20. Helicopters and Air tankers

Fire Ecology:

21. Fire Regimes
22. Fire Dependant Ecosystems
23. Effects of Fire Suppression
24. Case Studies

Prescribed Fire Management:

25. Management Objectives
26. Prescribed Burn Planning
27. Weather Prescription
28. Ignition Patterns
29. Post Burn Assessments

RRM299: Fire Management - Course Framework - Lecture and Lab Topics		
	Lecture Topics	**Lab Topics**
Week 1	Introduction to Fire Weather	**L1: Introduction to Fire Weather**
Week 2	Fire Weather	**L2: Fire Weather Observations and Reporting** – **Assignment #1** - Cloud ID
Week 3	Fire Weather	**L3: Fire Weather Index (FWI) System** – structure of FWI system – calculation of FWI values – **Assignment #2** - FWI calculation
Week 4	Introduction to Fire Behaviour – fire Behaviour video – fuels, weather , topography	**L4: Canadian Fuel Types of the FBP System** – FBP System – **Assignment #3** - Fuel Mapping
Week 5	Fire Behaviour . . . continued – combustion – fire triangle – fire descriptors – fire Behaviour triangle	**L5: Fire Behaviour** – video scenarios: Look up, Look down, Look Around – **Assignment #4** - FWI calculation
Week 6	Fire Behaviour . . . continued **Fire Weather/Fire Behaviour Exam (30%)**	**L6: Fire Safety, Fitness and Fireline Equipment** – 10 standard orders – fire control video – handtools – chainsaws
Week 7	**. . . SPRING BREAK . . .**	
Week 8	Fire Control Planning – fireline organization and communication – analysis – prevention – detection – pre-suppression – suppression	**L7: Fire Pumps and Water Delivery Systems** – Mrk III - fire pumps – pump set-up and operations video – water delivery systems – **Assignment #5** - pump pressure calculations
Week 9	Fire Control – fire safety – fireline organization – fireline equipment – fireline construction – methods of wildfire attack – stages of wildfire control	**L8: Helicopters and Air Tankers in Fire Suppression** – performance and limitations – safety, types and uses
Week 9	Fire Ecology – definitions and fire regimes – fire dependant ecosystems – fire adaptations	**L9: Fire Behaviour Prediction (FBP)** - Structure of FBP System – FBP Field Guide – **Assignment #6** - Wolf Lake Fire
Week 10	Fire Ecology – Fire - Case Studies (Yellowstone, 1988)	**L10: Initial Fire Assessment** – IFA process – video – **Assignment #7** - Gap Fire
Week 11	Prescribed Fire	**L11: Lab Exam (20%)**

Appendix G

Prioritized Learning Outcomes

PRIORITIZED LEARNING OUTCOMES - LECTURE COMPONENT				
Upon completion of the lecture component of the course, the student will be able to . . .		Priority Ranking		
		E.	H.D.	D.
1.	define fire weather	✓		
2.	identify and describe basic atmospheric properties and their implications to fire management	✓		
3.	describe concepts relating to pressure systems and the production of general wind patterns		✓	
4.	describe the effects of local wind patterns and their implications to fire management		✓	
5.	describe the diurnal relationship between temperature, RH and the moisture content of cured fine fuels	✓		
6.	identify and describe a number of indicators of atmospheric condition and stability	✓		
7.	describe the three phases of combustion		✓	
8.	identify and describe the components of the fire triangle and aspects of fire suppression relating to each	✓		
9.	identify and describe the methods of heat transfer			✓
10.	identify and describe the anatomical features of a fire			✓
11.	identify and describe the components and interrelationships of fire behaviour	✓		
12.	describe the components of fire control planning		✓	
13.	identify and describe progressive fireline construction techniques		✓	
14.	understand the importance of fire safety	✓		
15.	define a range of fire suppression terms and tactics	✓		
16.	identify the components of a typical fireline organization including the chain of command and communications			✓
17.	identify and describe the stages of wildfire control			✓
18.	define fire ecology	✓		
19.	identify and describe the elements of various fire regimes			✓
20.	describe the role of natural fire in shaping fire dependant ecosystems			✓

21.	identify and describe passive and active fire adaptations of fire adapted organisms			✓
22.	describe a number of mgt strategies which may be applied to fire-dependant ecosystems		✓	
23.	define prescribed fire and describe the history and context of fire use as a mgt tool		✓	
24.	identify specific goals and objectives for the use of prescribed fire		✓	
25.	identify the components of prescribed burn planning			✓
26.	identify and describe various prescribed fire ignition patterns and their application			✓
27.	apply course knowledge to various significant fire events as a case study	✓		
	TOTALS	**10**	**8**	**9**

E = Essential; H.D. = Highly Desirable; D. = Desirable

PRIORITIZED LEARNING OUTCOMES - LAB COMPONENT				
Upon completion of the lab component of the course, the student will be able to . . .		Priority Ranking		
		E.	H.D.	D.
1.	understand the collection of pertinent fire weather observations			✓
2.	correctly identify specific cloud types and describe their significance to fire weather		✓	
3.	locate and interpret fire weather forecasts and fire weather maps			✓
4.	chart the structure of the fire weather index system (FWI) system		✓	
5.	define, calculate and interpret values for the FWI system	✓		
6.	identify and describe the fuel types of the Canadian FBP System		✓	
7.	recognize the chain of command in fire operations relative to safety and communications		✓	
8.	evaluate and describe various situations with respect to the interaction of fire behaviour elements	✓		
9.	recognize the eighteen situations that shout "watch out" and list the "ten standard fire fighting orders"	✓		
10.	demonstrate the proper care and maintenance of fireline equipment		✓	
11.	identify and describe the proper set up and operation of the mark III fire pump		✓	
12.	identify and describe various water delivery systems		✓	
13.	calculate various pump pressures		✓	
14.	use the "Field Guide to the Canadian Forest Fire Behaviour Prediction (FBP) System for lab and field scenarios		✓	
15.	identify common types of helicopters and air tankers currently used in air attack operations.		✓	
16.	identify safe working procedures for working with both helicopters and air tankers	✓		
17.	identify and describe factors affecting helicopter and air tanker performance			✓
18.	conduct a fire assessment based on a given lab/field scenario	✓		
	TOTALS	**5**	**10**	**3**

E = Essential; H.D. = Highly Desirable; D. = Desirable

PRIORITIZED LEARNING OUTCOMES - FIELD COMPONENT				
Upon completion of the field component of the course, the student will be able to . . .		Priority Ranking		
		E.	H.D.	D.
1.	conduct all fire related activities safely and effectively	✓		
2.	recognize the equipment and organization of structural and wildland fire agencies		✓	
3.	recognize and describe the "wildland/urban interface"		✓	
4.	identify the importance of "cross training" in wildland/urban interface areas		✓	
5.	conduct a wildfire hazard assessment and make recommendations to mitigate problem areas	✓		
6.	demonstrate the safe and proper use of fireline hand tools			✓
7.	demonstrate the proper set up, operation, and care for the Mark III fire pump	✓		
8.	demonstrate the set up of various water delivery systems		✓	
9.	conduct a comprehensive initial fire assessment based on a given field scenario *(weather and time dependant)*	✓		
	TOTAL	**4**	**4**	**1**

E = Essential; H.D. = Highly Desirable; D. = Desirable

Appendix H

RRM 299 - Course Outline

The mission of the Lethbridge Community College is to develop the present and future workforce by providing high quality lifelong learning opportunities based upon knowledge and skills required by the community, business, and industry.

COURSE OUTLINE

Centre:	Environmental Science Karen Barnes - Team Leader	**Program:**	RRM and CE
Instructor:	**Brent Seeley** CB 2010 Ph: 382-6988 b.seeley@lethbridgecollege.ab.ca	**Course:**	RRM - 299 Fire Management
Class Time:	TBA	**Location:**	TBA

Prerequisites: none

Course Description:

This course involves the study of wildfire management. More specifically, this course deals with aspects of fire weather, fire behaviour, wildfire control, fire ecology, and the use of fire as a prescriptive management tool. This course has a lecture, lab, and field components, which are linked together to provide a range of learning opportunities for the student. The lecture component provides, theory and concept which backgrounds the application of field and lab work emphasizing hands-on experience and the practical application of knowledge gained in the course.

Learning Outcomes:

A. Lecture Component:

Upon completion of the lecture component of the course, the student will . . .

1. define fire weather;
2. identify and describe basic atmospheric properties and their implications to fire mgt;
3. describe concepts relating to pressure systems and the production of general wind patterns
4. describe the effects of local wind patterns and their implications to fire mgt
5. describe the diurnal relationship between temperature, RH and the moisture content of cured fine fuels
6. identify and describe the indicators of atmospheric condition and stability;
7. describe the three phases of combustion;

8. identify and describe the components of the fire triangle and aspects of fire suppression relating to each
9. identify and describe the methods of heat transfer;
10. identify and describe the anatomical features of a fire;
11. identify and describe the components and interrelationships of fire behaviour;
12. describe the components of fire control planning
13. identify and describe progressive fireline construction techniques
14. understand the importance of fire safety
15. define a range of fire suppression terms and tactics
16. identify the components of a typical fireline organization including the chain of command and communications
17. identify and describe the stages of wildfire control;
18. define fire ecology;
19. identify and describe the elements of various fire regimes;
20. describe the role of natural fire in shaping fire dependant ecosystems;
21. identify and describe passive and active fire adaptations of fire adapted organisms;
22. describe a number of mgt strategies which may be applied to fire-dependant ecosystems;
23. define prescribed fire and describe the history and context of fire use as a mgt tool;
24. identify specific goals and objectives for the use of prescribed fire;
25. identify the components of prescribed burn planning;
26. Identify and describe various prescribed fire ignition patterns and their application;
27. apply course knowledge to various significant fire events as a case study.

B. Lab Component:

Upon completion of the lab component of the course, the student will . . .

1. understand the collection of pertinent weather observations;
2. correctly identify specific cloud types and describe their significants to fire weather;
3. locate and interpret fire weather forecasts and fire weather maps;
4. chart the structure of the fire weather index system (FWI) system
5. define, calculate and interpret values for the fire weather index system;
6. identify and describe the fuel types of the Canadian FBP System;
7. recognize the chain of command in fire operations relative to safety and communications
8. evaluate and describe various situations with respect to the interaction of fire behaviour
9. recognize the eighteen situations that shout "watch out" and memorize the "ten standard fire fighting orders";
10. demonstrate the proper care and maintenance of fireline equipment
11. identify and describe the proper set up and operation of the mrk III fire pump
12. identify and describe various water delivery systems
13. calculate various pump pressures
14. use the "Field Guide to the Canadian Forest Fire Behaviour Prediction (FBP) System for lab and field scenarios
15. identify common types of helicopters and air tankers currently used in air attack operations.
16. identify safe working procedures for working with both helicopters and air tankers
17. identify and describe factors affecting helicopter and air tanker performance
18. conduct a fire assessment based on a given lab/field scenario

C. Field Component:
Upon completion of the field component of the course, the student will . . .

1. conduct fire operations safely and effectively;
2. recognize the equipment and organization of structural and wildland fire agencies
3. recognize and describe the "wildland/urban interface"
4. identify the importance of "cross training" in wildland/urban interface areas
5. conduct a wildfire hazard assessment and make recommendations to mitigate problem areas
6. demonstrate the safe and proper use of fireline hand tools
7. demonstrate the proper set up, operation, and care for the Mark III fire pump
8. demonstrate the set up of various water delivery systems
9. conduct a comprehensive initial fire assessment based on a given field scenario *(weather and time dependant)*

Required Text(s) and Materials:

Seeley, B., 2003, *RRM 299 - Fire Management Manual*, (From LCC Bookstore)

Instructor's Teaching and Learning Styles (Practices):

This course has a lecture, lab and field component. These components are linked together to provide a range of learning opportunities for the student. The lecture component provides, theory and concept which backgrounds the application of field and lab work. My teaching styles consist of explanation through lecture and lab topics, demonstration of procedures and techniques in lab, and coaching based on my field experience. I emphasize a need for critical thinking, concise and well-organized writing, and hands-on field practice.

Assignment/Activity/Exam List, Due Dates, and Value of Each

Lab Assignments	10 %	TBA - completed weekly
Midterm Exam	30 %	TBA - week of Feb 9
Lab Exam	20 %	March 26, 2004
Final Exam	30 %	TBA - final exam week
Field Trip Projects	10 %	completed during field trip
	100 %	

Lab Assignments: (10%) There will be a number of assignments relating specifically to lecture or lab topics. These will be weighted equally and be averaged over the length of the term.

Midterm and Final Exams: (30% each) These exams are largely independent; however material from the first half of the course strongly relates to a solid understanding of material in the second portion of the course.

Lab Exam: (20%) This exam will cover lab topics learned throughout the semester.

Field trip: (10%) There will be a one- or two-day field trip which will include a variety of practical hands-on experiences. Potential topics include: fire station tour, wildfire hazard assessment, fire line construction, smoke chase, fire pump set up and water delivery systems.

Other Learning Resources:

Students are encouraged to investigate various web-sites relating to fire management. There are too many to list here, but if you start at the following sites you can go from there.

http://www3.gov.ab.ca/srd/wildfires/index.html
http://www.ciffc.ca/
http://www.ciffc.ca/links.htm

Grading System:

Grade	Grade Points	Percentage
A+	4.0	95-100
A	4.0	90-94
A-	3.7	86-89
B+	3.3	83-85
B	3.0	80-82
B-	2.7	76-79
C+	2.3	73-75
C	2.0	70-72
C-	1.7	66-69
D+	1.3	63-65
D	1.0	60-62
F	0.0	0-59

Course Work Used as Examples:

Attached to this course outline is a release form authorizing your instructor to use any of your course submission as reference examples for future classes or other educational purposes. Please date and sign the form and submit it to your instructor. If you do not wish to have your course submission used for this purpose, please indicate this in the appropriate place on the release form. Date and sign the form and submit it to your instructor.

Retention of Student Records:

Most examinations and assignments, when corrected, are intended to be returned to students. If these exams and assignments are not picked up by students, they will be retained for at least three months from the end of the month in which the exam period falls. Any exams and assignments (e.g., final exams) that are not intended to be returned to students will be retained in accordance with the Alberta Freedom of Information and Protection of Privacy Act, s.34(b), for one year from the end of the month in which the exam period falls. After the appropriate retention period, these documents will be destroyed in a secure manner.

Attendance Policy:

Student's shall not be absent from any exam except in the case of severe illness, in which case please notify me prior to the exam and be prepared to provide a doctor's note as confirmation of your absence.

Intellectual honesty:

It is the students responsibility to become familiar with the students rights and responsibilities with respect to intellectual honesty as stated in the college calendar. Issues will be dealt with in an expedient manner in accordance with the stated policy.

Lab and class discussion:

Pertinent discussion and questions are **strongly encouraged** in class. Please show the appropriate consideration for me, as well as the other students, by not talking with others while the instructor is lecturing or answering student questions.

RRM299: Fire Management - Course Framework - Lecture and Lab Topics		
	Lecture Topics	**Lab Topics**
Week 1	Introduction to Fire Weather	**L1: Introduction to Fire Weather**
Week 2	Fire Weather	**L2: Fire Weather Observations and Reporting** – **Assignment #1** - Cloud ID
Week 3	Fire Weather	**L3: Fire Weather Index (FWI) System** – structure of FWI system – calculation of FWI values – **Assignment #2** - FWI calculation
Week 4	Introduction to Fire Behaviour – fire behaviour video – fuels, weather , topography	**L4: Canadian Fuel Types of the FBP System** – FBP System – **Assignment #3** - Fuel Mapping
Week 5	Fire Behaviour . . . continued – combustion – fire triangle – fire descriptors – fire behaviour triangle	**L5: Fire Behaviour** – video scenarios: Look up, Look down, Look Around – **Assignment #4** - FWI calculation
Week 6	Fire Behaviour . . . continued **Fire Weather/Fire Behaviour Exam (30%)**	**L6: Fire Safety, Fitness and Fireline Equipment** – 10 standard orders – fire control video – handtools – chainsaws
Week 7	. . . **SPRING BREAK** . . .	
Week 8	Fire Control Planning – fireline organization and communication – analysis – prevention – detection – pre-suppression – suppression	**L7: Fire Pumps and Water Delivery Systems** – Mrk III - fire pumps – pump set-up and operations video – water delivery systems – **Assignment #5** - pump pressure calculations
Week 9	Fire Control – fire safety – fireline organization – fireline equipment – fireline construction – methods of wildfire attack – stages of wildfire control	**L8: Helicopters and Air Tankers in Fire Suppression** – performance and limitations – safety, types and uses
Week 9	Fire Ecology – definitions and fire regimes – fire dependant ecosystems – fire adaptations	**L9: Fire Behaviour Prediction (FBP)** - Structure of FBP System – FBP Field Guide – **Assignment #6** - Wolf Lake Fire
Week 10	Fire Ecology – Fire - Case Studies (Yellowstone, 1988)	**L10: Initial Fire Assessment** – IFA process – video – **Assignment #7** - Gap Fire
Week 11	Prescribed Fire	**L11: Lab Exam (20%)**

Appendix I

RRM 299 - Student Learning Assessment Activities

Actual student learning assessment activities will not be included in this project in order to preserve the integrity of those assignments and more specifically the exams as secure instruments of student evaluation; however, learning assessment activities will include the following:

Student Learning Assessment Activities

Lab Assignments	10%
Midterm Exam	30%
Lab Exam	20%
Final Exam	30%
Field Trip Projects	10%
	100%

Lab Assignments: (10%) There will be a number of assignments relating specifically to lab topics. These will be weighted equally and be averaged over the length of the term. These assignments are closely associated with the higher priority learning outcomes and are intended to promote the practical application of knowledge learned throughout the course.

Assignment 1: Cloud Identification

Assignment 2: Fire Weather Index Calculations and Interpretation

Assignment 3: Fuel Type Mapping

Assignment 4: Fire Weather Index Calculations and Interpretation

Assignment 5: Fire Pump Pressure Calculations

Assignment 6: FBP - Wolf Lake Fire Scenario

Assignment 7: Initial Fire Assessment - Gap Fire

Midterm and Final Exams: (30% each) These exams are largely independent; however, material from the first half of the course strongly relates to a solid understanding of material in the second portion of the course.

Lab Exam: (20%) This exam will be based on the practical application of knowledge and skills learned and will cover all lab topics throughout the semester.

Field trip: (10%) There will be a one- or two-day field trip which will include a variety of practical hands-on experiences. Potential field projects are:

Project 1: Fire Station Tour

Project 2: Wildfire Hazard Assessment

Project 3: Fire Pump Set-up and Operation

Project4: Smoke Chase - Initial Fire Assessment

Appendix J

RRM 299 - Course Content

Course content material is not included as part of this project, but consists of the following:

- Course outline
- 10 power point presentations
- Course manual consisting of 9 modules with self check questions and answers
- Lab manual consisting of 10 labs and 7 assignments
- Field manual consisting of 3 projects
- 3 exams (midterm, lab and final)

Appendix K

RRM 299 - Course Assessment Matrices

Lecture Exam Question Weighting

Course Assessment Matrix **Course:** RRM299 - Fire Management - **LECTURE** **Date:** W-2004

Cognitive Domain - (% of test)					Prioritized Learning Outcomes (OC)					Types of Assessment - (Question #)					
	Knowledge	Comprehension	Application	% Total	OC - Rank	Lecture 60%				Identify	Define	Describe	T/F or MC	Short-Answer	Essay
						OC	E	HD	D						
	3.75	3.75		3.750	6	1	x				1,2	3			
	8.75	10.0		9.375	2	2	x			4,8,16	5	4,12	6		
	13.75			6.875	3	3		x		10,11		9			
		13.75		6.875	3	4		x				13,14			
		5.00		2.500	8	5	x					15			
	6.25			3.125	7	6	x			7	7				
	3.75			1.875	9	7		x				17			
		7.50		3.750	6	8	x			2					
				0.000	~	9			x						
				0.000	~	10			x						
	13.75	17.50		15.625	1	11	x			18,22		19	20,21		
	7.50			3.750	6	12		x				1	3		
	8.75	1.25		5.000	5	13		x				5,7,8			
	1.25	2.50		1.875	9	14	x				6	11			
	6.25	7.50		6.875	3	15	x				9,12	10			
	6.25			3.125	7	16			x			4			
				0.000	~	17			x						
		5.00		2.500	8	18	x					13			
	5.00			2.500	8	19			x			14			
	3.75	2.50		3.125	7	20			x				15,16,17,20,21		
	1.25	2.50		1.875	9	21			x	19			18		
		7.50		3.750	6	22		x					22	23	
	1.25	2.50		1.875	9	23		x			24	25			
		3.75		1.875	9	24		x				24			
		3.75		1.875	9	25			x			26			
				0.000	~	26			x						
		12.50		6.250	4	27	x							27	28
							10	8	9						
Midterm Exam	50.00	50.00		100.000		Assessment Ranking:				3	4	1	2	5	6
Final Exam	41.25	58.75													

Lecture Assessment Mechanisms:

Lecture Midterm (30%)	Grey
Lecture Final (30%)	Black

Lecture Exam Question Summary

Course Assessment Matrix **Course:** RRM299 - Fire Management - **LECTURE** **Date:** W-2004

Cognitive Domain - (number of Q's)				Prioritized Learning Outcomes (OC)					Types of Assessment - (Question #)					
Knowledge	Comprehension	Application	% Total	OC - Rank	Lecture 60%				Identify	Define	Describe	T/F or MC	Short-Answer	Essay
					OC	E	HD	D						
2	1		5.6	6	1	x				2	1			
3	4		13.2	2	2	x			3	1	2	1		
3			5.6	3	3		x		2		1			
	2		3.8	3	4		x				2			
	1		1.9	8	5	x					1			
2			3.8	7	6	x			1	1				
1			1.9	9	7		x				1			
	1		1.9	6	8	x			1					
				~	9			x						
				~	10			x						
2	3		9.4	1	11	x			2		1	2		
2			3.8	6	12		x				1	1		
2	1		5.6	5	13		x				3			
1	1		3.8	9	14	x				1	1			
1	2		5.6	3	15	x				2	1			
1			1.9	7	16			x			1			
				~	17			x						
	1		1.9	8	18	x					1			
1			1.9	8	19			x			1			
3	2		9.4	7	20			x				5		
1	1		3.8	9	21			x	1			1		
	2		3.8	6	22		x					1	1	
1	1		3.8	9	23		x			1	1			
	1		1.9	9	24		x				1			
	1		1.9	9	25			x			1			
				~	26			x						
	2		3.8	4	27	x							1	1
						10	8	9						
Midterm Exam 13	11		100.0					TOTAL	10	8	21	11	2	1
Final Exam 13	16													
TOTAL 26	27													

Lecture Assessment Mechanisms:

Lecture Midterm (30%)	Grey
Lecture Final (30%)	Black

Lab Assessment Weighting

Course Assessment Matrix **Course:** RRM299 - Fire Management - **LAB** **Date:** w-2004

Cognitive Domain (%of test)					Prioritized Learning Outcomes (OC)					Types of Assessment - (Question #)					
	Knowledge	Comprehension	Application	% Total	OC - Rank	LAB 30%				Identify	Define	T/F or M/C	Measure	Calculate	Demonstrate
						OC	E	HD	D						
	9			4.50	8	1			x	1,3	2	4,5,6			
	12		14.3	13.10	2	2		x		7,8					A1
				0.00	~	3			x						
	5			2.50	10	4		x		10					
	5		10, 28.6	21.80	1	5	x			9	11			17	A2, A4
	3		14.3	8.65	6	6		x				12			A3
	5			2.50	10	7		x		13					
				0.00	~	8	x								
	10			5.00	7	9	x			18					
	2	2		2.00	11	10		x		14,15	16				
				0.00	~	11		x							
	2			1.00	12	12		x		19					
			4, 14.3		~	13		x							
			14.3	9.15	5	14		x						20,21	A5
	11			12.65	3	15		x		28,29					A6
	4			2.00	11	16	x			22,27					
	6			3.00	9	17			x	23,24,25,26					
			10, 14.3	12.15	4	18	x								30, A7
							5	10	3						
Lab Exam	74	2	24	100.00		Assessment Ranking:				1	4	3	~	4	2
Lab Assign			100												

Lab Assessment Mechanisms:

Lab Exam	Black
Lab Assignments	A1, A2, . . .

Lab Assessment Summary

Course Assessment Matrix **Course:** RRM299 - Fire Management - **LAB** **Date:** w-2004

Cognitive Domain (%of test)					Prioritized Learning Outcomes (OC)					Types of Assessment - (Question #)					
	Knowledge	Comprehension	Application	% Total	OC - Rank	LAB 30%				Identify	Define	T/F or M/C	Measure	Calculate	Demonstrate
						OC	E	HD	D						
	6			4.5	9	1			x	2	1	3			
	2		1	13.1	2	2		x		2					A1
				0.0	~	3			x						
	1			2.5	11	4		x		1					
	2	1	2	21.8	1	5	x			1	1			1	A2,A4
	1		1	8.7	5	6		x				1			A3
	1			2.5	11	7		x		1					
				0.0	~	8	x								
	1			5.0	8	9	x			1					
	2	1		2.0	12	10		x		2	1				
				0.0	~	11		x							
	1			1.0	13	12		x		1					
			2	9.2	4	13		x						2	
			1	7.2	6	14		x							A5
	2		1	5.5	7	15		x		2					A6
	2			2.0	12	16	x			2					
	4			3.0	10	17			x	4					
			2	12.2	3	18	x								1, A7
							5	10	3						
Lab Exam	25	2	10	100.0					TOTAL	19	3	4		3	8
Lab Assign															

Lab Assessment Mechanisms:

Lab Exam	Black
Lab Assignments	A1, A2, . . .

Field Assessment Weighting

Course Assessment Matrix **Course:** RRM299 - Fire Management - **FIELD** **Date:** W-2004

	Cognitive Domain (% of test)				Prioritized Learning Outcomes (OC)					Types of Assessment						
	Knowledge	Comprehension	Application	% Total	OC - Rank	Field 10%				Participation	Demonstration					
						OC	E	HD	D							
			ALL			1	x			P1, P2, P3						
	10	10		6.667	4	2		x			P1					
	10	10		6.667	4	3		x			P1					
	10	10		6.667	4	4		x			P1					
	20	20		13.333	3	5	x				P1					
				0.000		6			x							
		25	25	16.667	2	7	x				P2					
		25	25	16.667	2	8		x			P2					
	20	40	40	33.333	1	9	x				P3					
							4	4	1							
P1	50	50		100.001		Assessment Ranking:				2	1					
P2		50	50													
P3	20	40	40													

Field Assessment Mechanisms:

P1 = Project 1: Wildfire Hazard Assessment
P2 = Project 2: Mrk III Fire Pump Exercise
P3 = Project 3: Smoke Chase - Initial Fire Assessment

Field Assessment Summary

Course Assessment Matrix **Course:** RRM299 - Fire Management - **FIELD** **Date:** W-2004

	Cognitive Domain (% of test)				Prioritized Learning Outcomes (OC)					Types of Assessment					
	Knowledge	Comprehension	Application	% Total	OC - Rank	Field 10%				Participation	Demonstration				
						OC	E	HD	D						
			ALL			1	x			3					
	10	10		6.667	4	2		x			1				
	10	10		6.667	4	3		x			1				
	10	10		6.667	4	4		x			1				
	20	20		13.333	3	5	x				1				
				0.000		6			x						
		25	25	16.667	2	7	x				1				
		25	25	16.667	2	8		x			1				
	20	40	40	33.333	1	9	x				1				
							4	4	1						
P1	50	50		100.001		Assessment Ranking:				1	7				
P2		50	50												
P3	20	40	40												

Field Assessment Mechanisms:

P1 = Project 1: Wildfire Hazard Assessment
P2 = Project 2: Mrk III Fire Pump Exercise
P3 = Project 3: Smoke Chase - Initial Fire Assessment