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## White Paper

# LOGIC: Creating Online Case Studies

By Dr Cathy Key and Roger Mundell

*Creating Online Case Studies using LOGIC (Learning Object Generator in Case Studies): Learner, Instructor and Technological Perspectives.*



[www.logicproject.ca](http://www.logicproject.ca)

## White Paper

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*Creating online case studies using LOGIC (Learning Object Generator in Case Studies) : learner, instructor and technological perspectives.*

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### Organizations Mentioned in this Report:

- a. CANARIE, Canada's advanced Internet development organization which facilitates the widespread adoption of faster, more efficient networks and by enabling the next generation of advanced products, applications and services to run on them.
- b. Royal Roads University, which provides online learning to mid-career learners from all over the world.
- c. TELUS Enterprise Solutions, an e-business and information technology solutions provider.
- d. The Justice Institute of BC which provides training in the areas of justice and public safety in Canada and in a number of countries around the world.
- e. Mercurial Communications, an innovative software firm from BC that develops custom solutions and products worldwide.

Roger Mundell (Director, Technology Transfer & Research at Royal Roads University) and Dr Cathy Key (an anthropologist and actionscript programmer at Mercurial Communications Inc.) were members of the LOGIC development team. This team also included education experts (from the Justice Institute of B.C. and Royal Roads University), course instructors (from the Justice Institute of B.C.) programmers (Telus Enterprise Solutions and Mercurial Communications) and interface designers (Royal Roads University and Mercurial Communications).

The LOGIC project was made possible thanks to the support of CANARIE.



## Introduction

# LOGIC: Creating Online Case Studies

*The benefits of using problem-based learning are widely recognized. The LOGIC application enables instructors to put the student center-stage in an unfolding, dynamic case study.*

Case studies are an important component of teaching and learning in all disciplines. Case studies allow students to put theory to practice in the context of the kinds of situations they will meet in real life. Case studies have been used widely in the classroom, but there are some disciplines in which classroom simulations are either too expensive or too dangerous. This has been a particular challenge for the Justice Institute of British Columbia, who train paramedics and firefighters.

Online case studies take considerable time and expense to develop and are difficult to re-use because successive generations of learners become familiar with their 'solutions'. LOGIC, the Learning-Object Case Study Generator Project, enables instructors to build and re-use online case studies for instruction and evaluation. The LOGIC project was built to facilitate and support the way learners and instructors actually approach problem-centered learning.

This white paper looks at the importance of online case studies within the context of the 'hierarchy of learning'. We examine the essential criteria for online case studies from the perspective of learners and instructors, and look at how the LOGIC application has handled critical issues such as ease of use, flexibility, durability and re-usability.

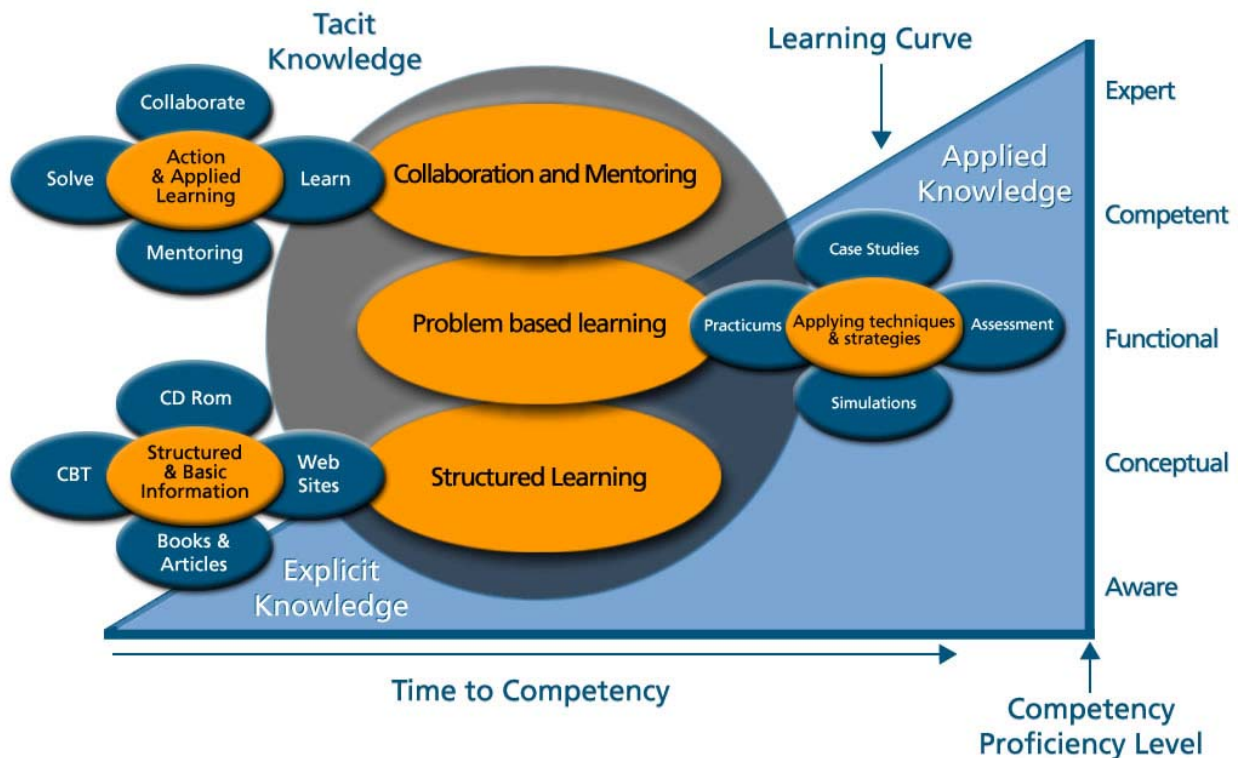
The LOGIC application was built using Macromedia Flash MX for reasons of usability and interoperability. In the final section we look at LOGIC from a technological perspective and show why Flash MX was a natural fit for this application.

## The Hierarchy of Learning

*"Learning occurs in stages and each stage engages a different type of content. Case studies are an important factor as the learner progresses from rote-learning to expertise."*

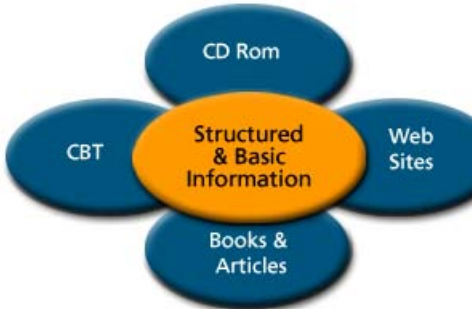
Royal Roads have recognized that learning occurs in stages or phases. At first the student must master the basic concepts, the 'factual' body of knowledge that underpins their discipline. As learners gain knowledge and experience they are able to participate in more complex problem solving and discussion.

Each stage in this 'hierarchy of learning' involves different processes and content. Three critical stages in this 'hierarchy' of learning are explicit knowledge, applied knowledge and tacit knowledge.



## The Hierarchy of Learning

## Explicit Knowledge



**Explicit knowledge** encompasses the basic facts about a subject. For example, the notes on the piano, the symbols in the periodic table, or the parts of an engine.

At this stage, the learner is not required to interpret information, apply it or even question it. The aim is to gain a certain level of competency.

Many really good methods of acquiring explicit knowledge exist, including books, articles, web-sites and CD-ROMS.

## Applied Knowledge



**Applied knowledge** is about applying learned facts and techniques to situations. At this stage, theoretical knowledge is transformed into functional understanding. Applied learning is where the rubber hits the road.

Applied knowledge can only be gained through problem-solving scenarios such as case studies, simulations and practicums. Few technologies currently exist that can effectively deliver this kind of course material.

## Tacit Knowledge



**Tacit knowledge** is an essential element of learning at all levels and occurs when a community of learners interact. It revolves around collaboration, discussion and group research. This sharing and questioning of knowledge and practice can create revolutions in understanding.

Collaborative learning can take place as a classroom discussion or mentoring program. There are also many ways in which technology can facilitate this process, such as chat rooms and bulletin boards.

The Explicit and Tacit levels of learning are the most widely practiced both in the classroom and online. Factual content is readily communicated through books, lectures, video tapes and online courseware. Collaborative learning occurs spontaneously through classroom discussion, student mentoring, bulletin boards and chat rooms.

Applied knowledge is widely recognized as an essential component of teaching and learning. Acquiring applied knowledge is the difference between having a theoretical understanding of a subject and the ability to apply this theory in real life. After all, no-one would consider climbing Mount Everest after reading a book about mountain climbing techniques. Applied learning gives us the skills – and the confidence – to meet the challenges of the real world.

The importance of applied knowledge in vocational courses such as medicine, architecture and accounting is obvious. Similarly, problem-based learning is a central component of professional training courses (e.g. firefighting, health and safety and computer programming). Even in the more academic disciplines there comes a point when it is not what you know that counts – but what you do with that knowledge.

While applied knowledge is recognized as a critical component of a well-rounded education, it can be difficult and costly to develop effective and safe training practices either in the classroom or online.

## Applied Learning in the Classroom

*The purpose of applied learning is to train students to think on their feet. Case studies must train students to deal with difficult and dangerous situations where there is not always a 'right' answer.*

Applied learning is essential if a student is to gain any real understanding of a subject or discipline. However, course materials that develop applied knowledge can be more challenging to create than those for explicit or tacit knowledge.

Placing students in real-life situations to develop their skills can be dangerous, expensive, or both. Firefighting, medicine and health-and-safety training are all subjects where getting the wrong answer can have horrific consequences.

Another challenging aspect of applied learning is that it is non-linear and often does not conform to the black and white certainties of text book facts. To put it bluntly, the real world is messy. Every reaction to a situation will have consequences – which may be good, bad or neutral in the context of that situation. At the same time, several different paths may all lead to the desired outcome.

Learners at the Justice Institute of BC, include both mid-career and pre-employment students in justice and public safety professions, who generally work in the context of what is called a high risk environment. Effective training is fundamental to safety for both the public and the professionals. Justice Institute learners often work in challenging environments, under time pressure, with conflicting and changing information, under a variety of environmental circumstances, while still requiring a high degree of professionalism and accountability after the fact.

Case studies are an essential training component for the Justice Institute. Since the consequences of making a mistake could be fatal, the Justice Institute have turned to online resources to find a safe yet effective means of delivering course material. However, case studies take considerable time and expense to develop and are difficult to re-use because successive generations of learners become familiar with their 'solutions'.

## Applied Learning Technology

*"Our interest in the LOGIC concept arose from our dissatisfaction with our ability to provide at least some level of applied learning to our online learners using existing online learning tools. This is a significant gap in the array of technologies available to educators. While there is a glut of tools that support explicit and tacit learning, there is very little in the way of online tools that will enable applied content to be delivered over the web."*

- Irwin DeVries, The Justice Institute of B.C.

As we have seen, cases studies can be difficult, expensive and even dangerous to deploy in the classroom. Moreover, case studies are particularly important for training adults, who recognize the importance of being able to apply their skills to the real world. Adult learners are often in full-time employment and may not be able to afford the time or travel for *in-situ* learning. There is a great need for technology that can support the development of online case studies.

A look at the e-learning market shows that very few applications have been designed to develop applied learning skills. Most applications address either explicit learning or tacit learning. The dearth of tools on the market reflect the difficulties of building this type of content:

### **1) Creating case studies requires programming knowledge**

Case studies are very difficult to build using conventional authoring tools. On the one hand, are tools that are too simplistic, requiring a linear screen-by-screen progression through the content. At the other extreme are sophisticated applications such as Macromedia's Authorware which require training to use effectively. LOGIC was built to address the requirement for an authoring tool that non-programmers could use to build case studies.

### **2) Modifying case studies is complex and time-consuming**

Online case studies have a short shelf-life, as the solutions to the problems are quickly spread through the community of learners. This is particularly frustrating, as case studies are expensive and time consuming to create and modify.

### **3) Using multi-media in case studies causes bandwidth problems**

The rich media required to bring a case-study to life can be bandwidth intensive. This is especially true of video and audio content.

**4) Inter-operability:** Sharing cases studies between learning management systems is difficult as there is no current standard for delivering web-based content, including case studies, onto these systems.

## LOGIC: The Next Generation in Online Case Studies

*"The landscape of online learning is changing ... What was once a linear, static collection of text-driven content can be transformed into a well-organized, dynamic and engaging learning experience."*

- Heins and Heims (Creating Learning Objects with Macromedia Flash MX)

The creation of branching case studies, that respond directly to the knowledge and experience of the learner has tremendous potential to impact learning. However, in order to deliver case studies effectively online we need to change the way we create and deploy online content. Case studies inherently involve non-linear thinking, rich media and an approach that puts the student center stage within a problem or situation.

LOGIC is an authoring environment for creating online case studies that can be readily used and re-used, and will evolve with the current best practice within a discipline.

LOGIC was developed in collaboration with instructors at the Justice Institute and Royal Roads University who are very familiar with the challenges of developing effective case studies, both offline and online.

A number of key issues had to be addressed in order to create an effective tool. In the following sections we look at the development of case studies from the perspective of learner and instructors.

LOGIC was built using Macromedia's Flash MX. There were some important technical and usability issues that could not be addressed using more traditional HTML based languages. In the section 'LOGIC from a Technological Perspective' we examine these issues in some detail.

Flash MX also allowed us to address the needs and challenges of both learners and instructors. In the following sections we examine the benefits of the LOGIC application from the perspectives of the learner and the instructor and describe the technological background to the project.

## LOGIC from the Learner's Perspective

*Applied Learning requires content that is dynamic, engaging and replicates real-life as closely as possible. This means it must use rich media, non-linear processes and deliver multiple streams of information to the learner.*

Our goal with Logic is to deliver immersive content which re-creates the kinds of situations the student will face in real-life. In delivering case studies there are a number of critical components to a successful learning experience:

- Life-like content
- Stimulating learning environment
- Non-linear content with multiple learning paths
- Random elements
- Responsiveness

### 1) Case Studies Require Life-Like Content

Online case studies aim to imitate real life situations as closely as possible.

A compelling way of creating scenarios is to use rich media. LOGIC makes use of video, images, audio and text to create a multi-media experience for the learner.

Accelerated learning is more likely when multiple sources of information are used. In addition to media elements, LOGIC uses 'indicators' to provide critical supplementary information.

The figure on the following page shows content delivered by the Justice Institute of B.C. to trainee paramedics. The student has three primary sources of information:

- (i) An image of the patient;
- (ii) A textual description of the situation;
- (iii) A series of 'indicators' that display the patient's vital signs, such as pulse, skin color and responsiveness.


Using these multiple descriptions, the student must decide on urgency of action in each case. Possible courses of action are shown as options from which the student must make a selection.



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LEARNING TOGETHER FOR SAFER COMMUNITIES

## Patient Assessment



The patient is a 23 year-old woman lying supine. Her eyes are closed. There is a large pool of blood next to her head. She does not respond to verbal or painful stimuli.

Her airway is clear. You hear short, gasping, irregular respirations. Her radial pulse is slow and irregular. You note a large laceration on her forehead with no bleeding. You can see broken bones and brain matter in the wound. You can feel deformities at the base of the neck. Her left shoulder is dislocated. Her skin is pale, cold, and diaphoretic.

**What is your triage classification of this patient?**

**1** Red ? Category I  
(Immediate)

**4** Black ? Category IV  
(Deceased)

**2** Yellow ? Category II  
(Urgent)

**3** Green ? Category III  
(Delayed)

**INDICATORS**

<p><b>PULSE</b> <span style="float: right;">▼</span></p> <p>Slow/erratic</p>	<p><b>SKIN</b> <span style="float: right;">▼</span></p> <p>Pale/cool/diaphoretic</p>	<p><b>AIRWAY</b> <span style="float: right;">▼</span></p> <p>Clear</p>
<p><b>RESPONSE</b> <span style="float: right;">▼</span></p> <p>Unresponsive</p>		

## 2) Learners Prefer Good Visual Representations

While stunning graphics cannot make up for poor instructional content, a learning environment that looks good, feels good and is fun to use will create a more engaging experience and increase the amount of time the learner is prepared to spend in front of the computer.

LOGIC was designed to be visually appealing and easy to navigate. The learner is able to assess a described situation and choose a response which naturally takes them to the next step in the case study. The LOGIC tool itself is invisible to the learner who is able to keep their focus where it should be, on the content.

### 3) Content Must Respond to the Actions of the Learner

*The LOGIC tool uses a 'snakes and ladders' approach to send learners down different paths depending on their responses.*

In a case study the learner must assess the situation and decide on a course of action. Different actions can have very different effects. Unlike a book, in which the story follows a prescribed linear course from start to finish, in a case study the storyline unfolds in response to actions taken by the learner in the past.

Ultimately the objective of a case study is to train someone to deal with complex situations. In real life, the wrong action can have dire consequences and going back in time is not an option. Within a training situation, it is important for a student to be able to retrace their steps and have the opportunity to try, try again until they have assimilated the techniques required for success.

The LOGIC application is built on a 'snakes and ladders' analogy, where successful students can be fast-tracked to new content and unsuccessful students are given the chance to re-try.

In some situations there may not be a right or wrong answer or there may be many different paths that lead to a correct outcome. The LOGIC tool is designed to deal with these 'shades of gray' by creating multiple paths.

### 4) Content Must Change Rapidly to Create New Learning Challenges

*Students are good at finding the short-cuts. Content which incorporates random elements and is easy to change keeps successive generations of learners on their toes.*

One of the problems faced by the Justice Institute was that the correct answers to a scenario would quickly spread through the student population. Course material was quickly made obsolete as students learnt how to beat the system.

The LOGIC tool has a powerful randomizing element, so that each student can be delivered a unique learning experience. For example, by randomly generating images of different patients and descriptions, the Justice Institute is able to ask the same question ('what is your triage classification of this patient') within multiple contexts.

## LOGIC from the Instructor's Perspective

*From looking at the learner's perspective, it is clear that case studies must incorporate multi-media, be responsive to the students actions and involve multiple paths. The LOGIC authoring tool was developed to create exactly this type of content.*

LOGIC is an authoring tool for designing multi-pathed, multi-media content. In this respect, it is not the first tool of its kind. Applications such as Macromedia's Authorware have long been available to create this type of content. However, these applications have proven to be difficult to use and require training and expertise before they can be usefully applied.

In developing the LOGIC authoring application several factors were critical. Firstly, it had to be powerful enough to embrace complex, flexible scenarios. At the same time, LOGIC had to be easy to use and re-use. To stand the test of time, it must be easy to mix-and-match the elements of the case study so that it can rapidly evolve in parallel with the needs of the learners.

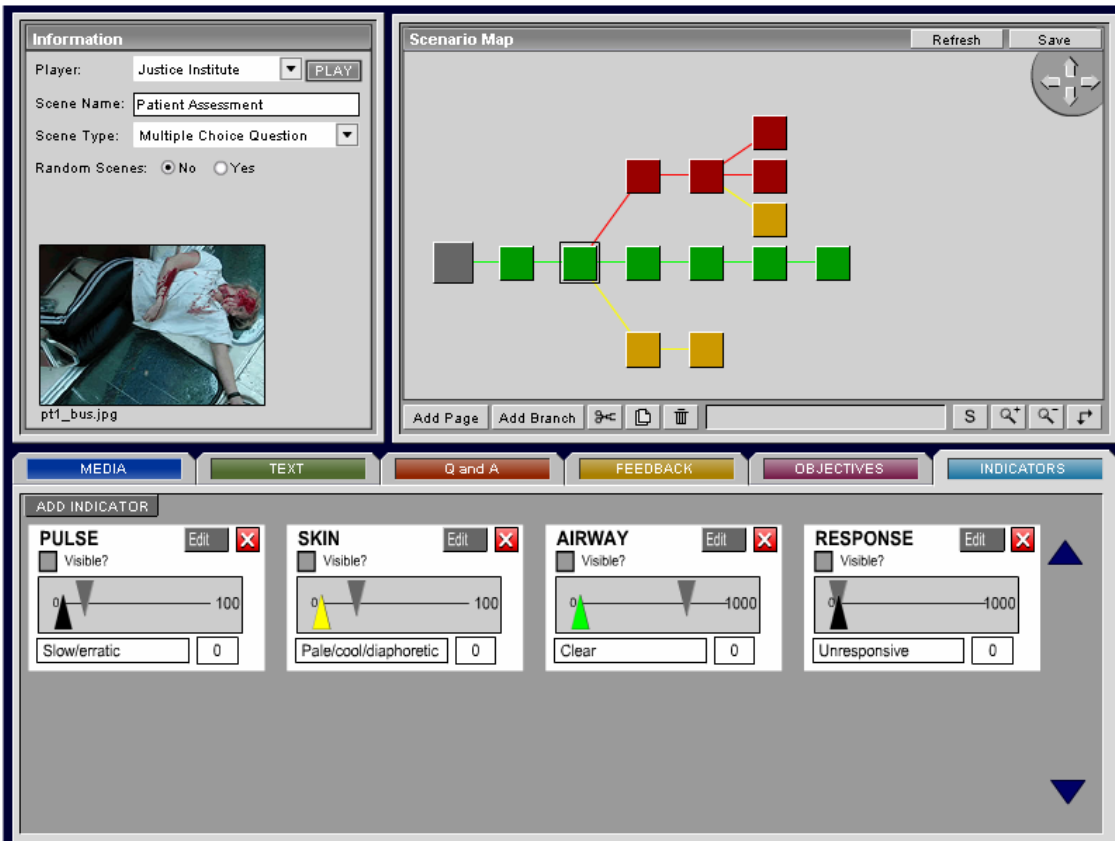
In the following sections we focus on the features of the LOGIC authoring tool in relation to these critical issues.

### 1) Flexibility and Ease of Use

*The LOGIC application must satisfy two competing criteria: ease of use and the ability to create flexible, complex scenarios.*

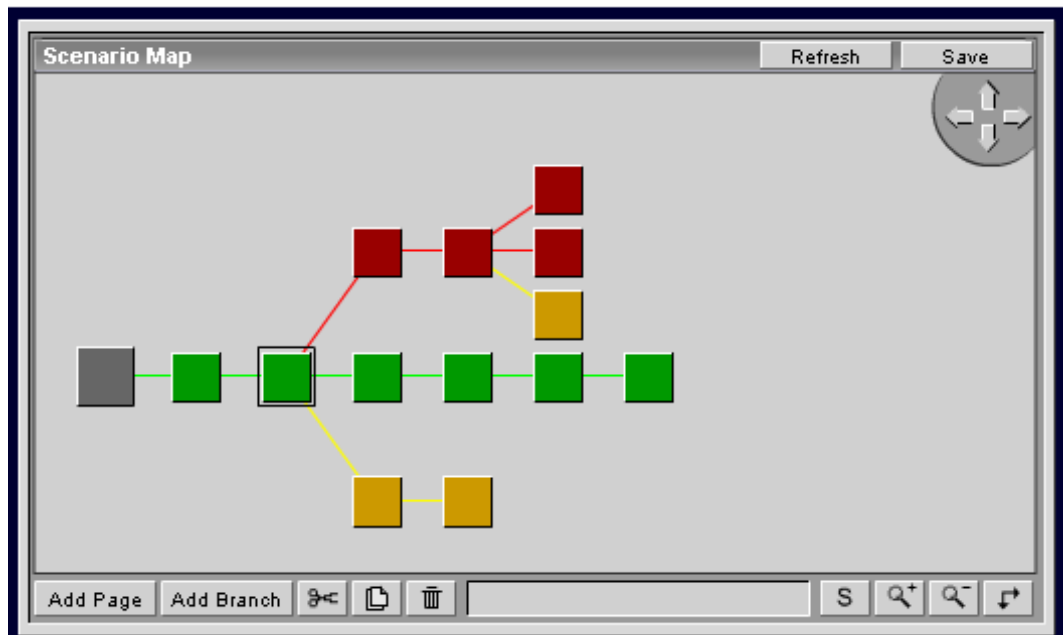
Ease of use is an obvious criteria for any application, but one that can be very difficult to achieve in practice. This was a significant challenge for the LOGIC project. The primary aim was to create an authoring tool that could produce complex, branching case studies where the plot twists and turns in response to the user. Our challenge was to create an interface that would allow almost infinite levels of complexity, while at the same time keeping the interface simple and intuitive.

The LOGIC user interface evolved through a series of arrangements. Finally we arrived at a simple, single-screen format as shown below where everything the author requires to create their scenario is available within two clicks of the mouse.



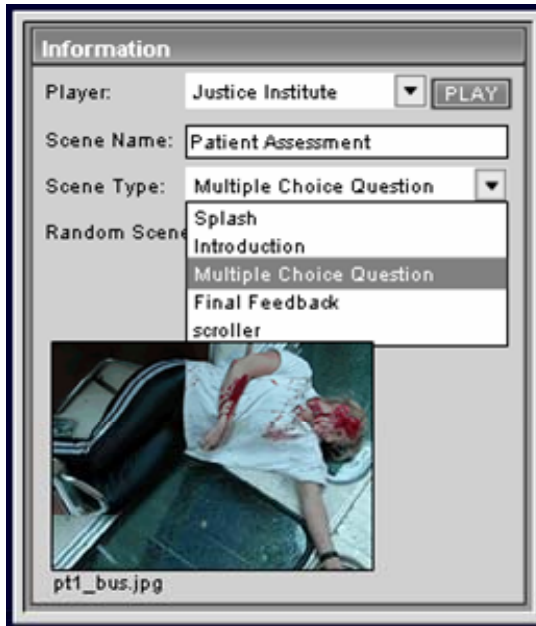
The LOGIC authoring screen is divided into three main areas: the map, the screen information panel and the workbench.

**The Map:** The map provides the author with an overview of all the content within the case study. This 'big picture' view shows the structure of the case study, including the main branch points. The map consists of linked scenes, where each scene is a collection of content (e.g. an image, a question and some answers). The main decision points in the case study are shown as branches on the map, which are color-coded to indicate the correct, incorrect or partially correct routes.



The map also serves as the primary navigation system. Clicking on any scene pulls up the content of that scene on the rest of the interface. The map is also used to add pages and branches, and to copy, cut and paste scenes.

## The Information Panel



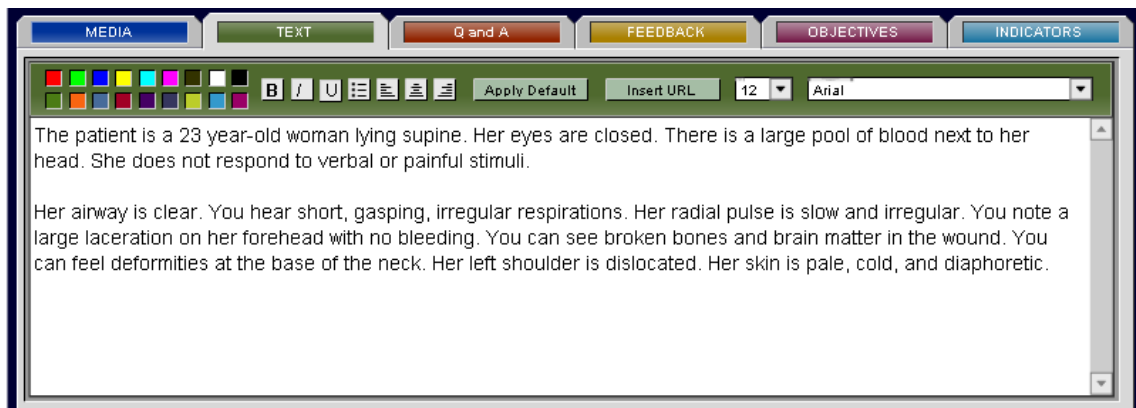
The information panel allows the author to set the scene attributes, such as the title and the scene type. Different scene types (for example, introduction and multiple choice) display different types of content.

The author may also select the player-back environment, in other words the interface in which the student will see the content.

Selected media are also shown in the information panel to give the author a visual cue as to which scene they are currently working on.

## The Workbench

The Workbench is where most of the actual authoring occurs. This is where the author can add elements including media, text and questions and answers and feedback to the currently selected scene. In the figure below, the text tab has been selected and the author is able to add and format text and insert URLs.



## 2) The Authoring Process

*With or without technology, creating case studies is conceptually challenging. LOGIC was designed to facilitate multi-pathed authoring by building on the best practice of experienced course developers.*

Creating case studies is conceptually challenging. Most instructors are more familiar with creating linear content (e.g. a PowerPoint presentation) where the course material proceeds through a series of steps from start to finish. However, for a case study it is necessary to create a multitude of different paths through the content. Although each learner begins at the same starting point, there may be many end points.

Initially, the LOGIC development team created an authoring environment in which the author would immediately be able to add multiple paths branching to different parts of the content. However, as we watched instructors struggle to create divergent storylines it became clear that multi-path thinking does not come easily or naturally to most people.

When building case studies instructors tend to start with the 'right path' in mind. The first step is to create a linear sequence of screens which define the correct route. Only once the right path is determined does the instructor add divergent branches.

The LOGIC interface was re-designed to reflect the actual working practice of instructors. The author starts by creating the 'right' path which is plotted on the map as a straight, green line. The author then adds branches to the path which lead to different content paths.

LOGIC was designed to accommodate up to three different types of branch, which correspond to the correct, incorrect and partially correct paths (color-coded green, yellow and red). The author uses the question and answer panel on the workbench to define which actions will lead to the correct, incorrect and partially correct routes. For example, in the figure below, the fourth answer (Black) is the only right answer and leads to the green route.

The screenshot shows the LOGIC authoring interface with several tabs: MEDIA, TEXT, Q and A, FEEDBACK, OBJECTIVES, and INDICATORS. The 'Q and A' tab is active, displaying a question and a table of answers.

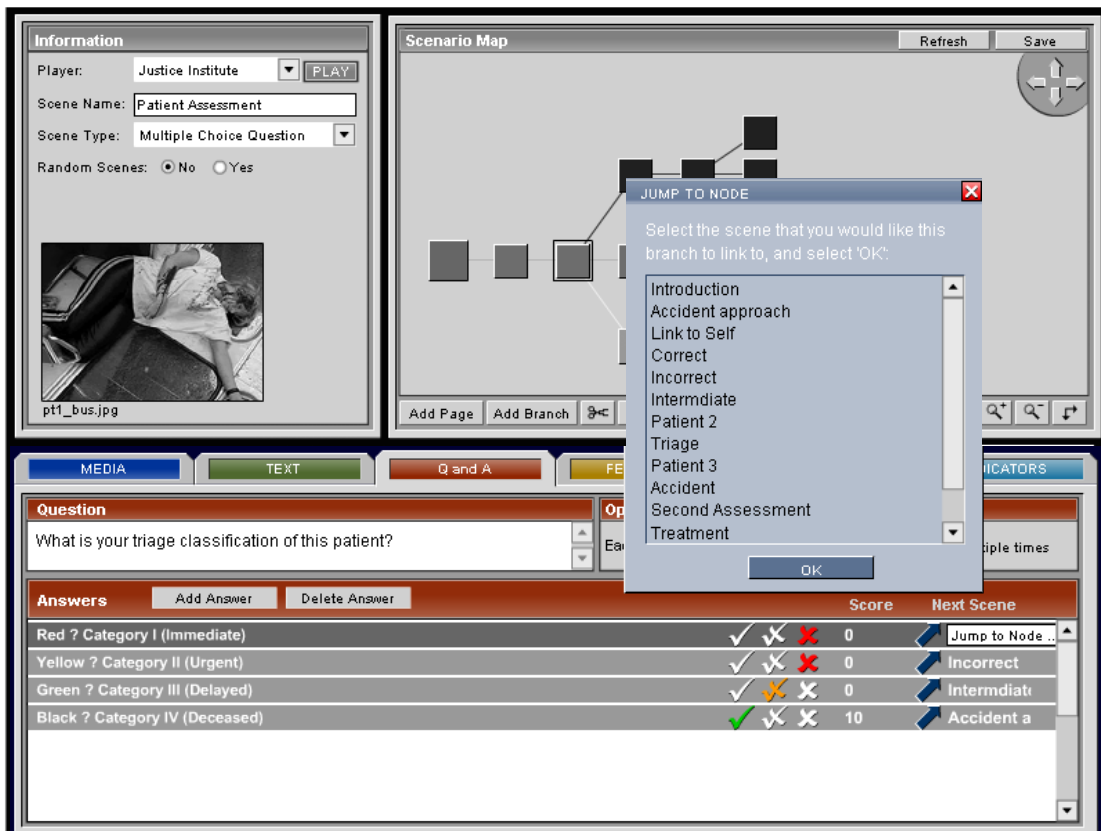
**Question:** What is your triage classification of this patient?

**Options:** Each answer to be selected:  once only  multiple times

Answers	Score	Next Scene
Red ? Category I (Immediate)	0	Wrong Ans
Yellow ? Category II (Urgent)	0	Wrong Ans
Green ? Category III (Delayed)	2	Intermedia
Black ? Category IV (Deceased)	10	Correct As

As the project evolved we found this restriction to three branches limiting. If a scene could branch to three places why not 10 places? Or 100? Illustrating more than three branch points on the map would have introduced confusing visual complexity. Instead, we incorporated a 'jump to node' function, where each answer can be connected to any other within the scenario. Selecting 'jump to node' (as shown below) brings up a list of all the other scenes within the case study from which the author can select the next stepping stone in the content.

Since every answer can have a different jump point, it is possible to create very complex case studies that are based on the 'snakes and ladders' concept discussed earlier.



### 3) Access to Multi-media

Authors need to be able to access multi-media content quickly and easily. Each scene within a case study may consist of one or more of the following elements:

- Images
- Video
- Audio
- Documents (e.g. spreadsheets, pdfs)
- Text
- Web resources

The author has a media library, which is created either by scanning their local computer for appropriate resources or from an online repository. Available media are listed in a searchable area, and can be sorted for images, movies, audio and documents.

The screenshot displays the LOGIC software interface, which is used for creating online case studies. The interface is divided into several sections:

- Information Panel:** Located on the top left, it contains fields for "Player" (set to "Justice Institute"), "Scene Name" (set to "Patient Assessment"), "Scene Type" (set to "Multiple Choice Question"), and "Random Scenes" (set to "No"). Below these fields is a small image of a person lying on a stretcher, labeled "pt1\_bus.jpg".
- Scenario Map:** Located on the top right, it shows a flowchart with various colored boxes (red, green, yellow) connected by lines, representing the structure of the case study. It includes "Refresh" and "Save" buttons and a directional pad.
- Media Library:** Located at the bottom, it is divided into several sub-sections:
  - Available Media:** A list of files including "lots\_of\_animals\_CD.swf", "map3.jpg", "map3b.jpg", "map3c.jpg", "minilostmonkeys.jpg", "MRAppAmb.jpg", "new-chick.jpg", "placard\_tanker.jpg", "police1.jpg", "pt1\_bus.jpg", "pt1\_triage.jpg", "pt2\_bus.jpg", and "pt2\_triage.jpg".
  - Sort Media:** Buttons for "All Media", "Images", "Movies", "Audio", and "Documents".
  - Preview:** A small image of a person in a yellow jacket, labeled "Insert Media".
  - Media Information:** Fields for "File" (set to "police1.jpg"), "Author" (set to "Cathy"), and "File Type" (set to "image").
  - Audio:** Fields for "Text" and "Selection" (set to "none"), with "SELECT" and "DELETE" buttons.

## 4) Durability and Re-usability

*Creating course materials requires considerable time and energy. This investment must have a pay-off for years to come if the exercise is to be worthwhile. Long-term durability and re-usability of the course material is essential.*

Case studies, like any good learning material, take a long time to create. To make it worthwhile to create a case study, the ability to reuse the content in years to come and/or in different learning contexts is essential

Durability and re-usability were defined by the Masie Center (2002) as critical elements in e-learning. Durability refers to the lasting value of e-learning content, while re-usability is the utility of content in different contextual situations.

In the past, online case studies have had a short shelf life. Typically, the content has been 'hard-wired' and subject specific. The high level of technical skill required to change elements of the case study has restricted their durability. Being subject specific, it has been difficult to translate the case study into different learning contexts.

In order to facilitate the durability and re-usability of case studies, LOGIC was built on the following criteria:

- The building blocks of a case study are 'learning objects' which can be shared by communities of instructors.
- Authors must be able to easily access their own **personal repositories** of learning objects.
- For the case study to be durable, it must be easy to change elements.
- For the case study to be reusable it must easily translate to different learning contexts.

### **1) The building blocks of a case study are 'learning objects' which can be shared by communities of instructors.**

The LOGIC application was built upon the concept of Shared Learning Objects. A learning object is defined as a re-usable resource, such as text, video or graphics, that has been tagged with an XML description and stored in an online library. A growing number of leaning object repositories now exist which instructors can use to find building blocks for their own courses.

At the Justice Institute there are a handful of content experts who create courses along established pedagogical criteria. This content is shared with 150 instructors who can draw appropriate case studies and deliver them wholesale to their students, or tweak and adapt to them their needs.

While creating the LOGIC application it became clear to us that learning objects can be more useful if we consider them as 'sets' of related content. For example, an instructor can create a set of media that relate to fire-fighting, or a set of indicators relating to car mechanics. These sets can be imported and reused together as a group.

## **2) Authors must be able to easily access their own personal repositories of learning objects.**

While LOGIC was built to tie-in with learning object repositories, we also recognize that instructors can be very protective of their intellectual property as creating a personal repository of slides, graphics, worksheets, spreadsheets, lesson plans and lab materials represents a considerable investment in time, energy and know-how.

LOGIC has been developed to tap into both shared repositories and personal repositories. Authors can mix-and-match from their personal pool of content (e.g. images, spreadsheets, overheads) to create an infinite variety of course material. Using LOGIC, case studies can evolve over time and will be an important item in the instructor's arsenal of well thought out, fine-tuned learning materials.

## **3) For the case study to be durable, it must be easy to change elements.**

In all teaching and learning, instructors will typically invest heavily in the first two years of a course to create new slides, worksheets, overheads, lab exercises and online learning materials. In subsequent years, these course materials are tweaked and re-worked and the content evolves gradually as new ideas and theories come into play.

Heavy workloads mean that many instructors may be putting together lessons just hours or days ahead of time. To be effective, technology must replicate the working practice of instructors, i.e. to make it easy to create just-in-time lessons that build on previous years' content.

The LOGIC authoring tool's graphical interface makes it easy to swap any element of the case study, whether that be an image, question or movie. This quick, easy re-deployment of material saves time and money and keeps the content meaningful. It also prevents the answers being passed on from one generation of learners to the next.


**4) For the case study to be re-usable it must easily translate to different learning contexts.**

The world of e-learning is growing at an exponential rate, thousands of pieces of new content appear on the market every year. However, out-of-the box content rarely translates perfectly to new learning contexts, especially for adult learners.


This problem is exacerbated by the multitude of learning management and content management systems. There are almost as many learning management systems as there are universities and colleges. A piece of content developed in web CT is by no means compatible for replay in a college running Blackboard.

The LOGIC application is a generic tool that can be used to author any type of content. However, the play-back device is subject/institution specific. In other words the same piece of content can be displayed in many different ways.

In addition, for reasons we will explore in the next section, LOGIC requires no plug-ins or special play-back devices. ***It can run in any learning management or content management system.***



### Patient Assessment



The patient is a 23 year-old woman lying supine. Her eyes are closed. There is a large pool of blood next to her head. She does not respond to verbal or painful stimuli.

Her airway is clear. You hear short, gasping, irregular respirations. Her radial pulse is slow and irregular. You note a large laceration on her forehead with no bleeding. You can see broken bones and brain matter in the wound. You can feel deformities at the base of the neck. Her left shoulder is dislocated. Her skin is pale, cold, and diaphoretic.

**Question and Answers**

What is your triage classification of this patient?

1 Red ? Category I (Immediate)

2 Yellow ? Category II (Urgent)

3 Green ? Category III (Delayed)


4 Black ? Category IV (Deceased)

**Indicators**


PULSE — Slow/erratic

RESPONSE — Unresponsive

SKIN — Pale/co



### Patient Assessment



The patient is a 23 year-old woman lying supine. Her eyes are closed. There is a large pool of blood next to her head. She does not respond to verbal or painful stimuli.

Her airway is clear. You hear short, gasping, irregular respirations. Her radial pulse is slow and irregular. You note a large laceration on her forehead with no bleeding. You can see broken bones and brain matter in the wound. You can feel deformities at the base of the neck. Her left shoulder is dislocated. Her skin is pale, cold, and diaphoretic.

What is your triage classification of this patient?

1 Red ? Category I (Immediate)

2 Yellow ? Category II (Urgent)


3 Green ? Category III (Delayed)

4 Black ? Category IV (Deceased)

SKIN — Pale/co

AIRWAY — Clear

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RESPONSE — Unresponsive

The LOGIC tool separates the authoring from the presentation of the content. This means that the same material can be presented in many different contexts.

## LOGIC from a Technological Perspective

*LOGIC creates re-usable course material that can be used by anyone, anywhere on any learning or content management platform.*

Learning is most effective when we are actively engaged with the content. One of the barriers to the development of effective e-learning is forcing the user to grapple with technology to get a result.

LOGIC delivers multi-media, graphical, dynamic content to learners and instructors over the web regardless of their choice of computer, browser or learning management system. No special plug-ins or executable files are required.

LOGIC runs using technology that can be found on 98% of computers: the Macromedia Flash player. While many developers still think of Flash MX as the favorite toy for animators and graphic artists, the LOGIC development team recognized Flash MX as a full application development environment.

We chose to do the main programming of the LOGIC application in Flash MX and use XML as the means for saving and storing case studies and accessing media.

There were several key reasons why this combination of Flash MX and XML was better suited to this project than using a database and a more traditional HTML- and/or Java-based programming language:

### 1) Creating a Graphical User Interface

One of our top priorities was to create a graphical user interface that is easy to use in spite of the complexity of the underlying data. Flash MX is capable of visually representing large amounts of information and is ideally suited to a top-down, big-picture approach.

Flash MX allows a more flexible approach to interface developments. It does not rely on annoying pop-ups which can confuse the user and may be blocked by ad-blocking software.

## 2) Programming Algorithms are Invisible to the User

HTML-based applications are frustrating due to the requirement for a continuous 'conversation' between the user's input and the server. Web applications built in HTML involve continuous screen refreshes and force the user through a series of linear steps to get to a result. This stop-start, linear method is annoying for the user who is constantly reminded of these programming constraints every time she waits for the screen to re-load.

Using Flash MX we were able to minimize the numbers of calls to the server. In fact, the only time that the screen refreshes is when the case study is saved.

The author is able to work in their own style, and is not constrained by the linear processes conceived of by the programmer. The 'business logic' that drives the LOGIC application is totally invisible to the user.

## 3) Portability to Different Learning Management Systems

Many different Learning Management Systems and Content Management Systems are currently available, and it was important that LOGIC would be able to interface seamlessly to any of these without requiring special plug-ins or executables.

The Flash player is lightweight and found on most computers. By using Flash we were able to ensure that LOGIC will run correctly in any learning management system that is capable of delivering web-based content.

## 4) A Web-based System that Works Under All Conditions

LOGIC is a web-based system but we did not want it to be hampered by the platform and browser issues that cause headaches for many internet application developers.

While 70% of today's computer users are using Internet Explorer on a PC (<http://www.upsdell.com/BrowserNews/stat.htm>) there are a significant number of people using Macs, Netscape and other combinations of hardware and browser. These significant others, while making up only 30% of the user base can absorb up to 70% of the development time during testing and troubleshooting.

The Flash player is platform independent. By building in Flash we side-stepped browser and hardware problems.

## 5) Streaming Video

The LOGIC tool needs to be able to handle many different types of media and to easily interface with online repositories of content and/or the authors own media residing on their computer.

The media itself is dynamically loaded into the LOGIC tool at run-time. Flash MX's streaming media capabilities and efficient compression minimize the time spent waiting for movies and images to load.

## 6) Saving and Loading XML

LOGIC needs to be able to 'talk' to both learning object repositories (for media loading) and learning management systems (for the delivery of the case study to the student). Since learning objects are tagged with XML and XML is *the* universal development language it was a natural fit for the LOGIC application.

An XML description of the available media is loaded into the LOGIC tool at runtime, and the tool uses this to locate and display the available media files.

XML is also used to save and store the structure of the case study. From one perspective, you could conceptualize LOGIC as an engine for generated structured XML files that describes the relationship between different types of content.

## LOGIC: Putting Case Studies into Practice

*"I think this [LOGIC] is a great tool for learning and probably the best thing I have taken part in this year. I thought the visual content and call scenario was super and more realistic than our classroom simulations. It showed me my weaknesses and strengths in a triage situation which I had not had enough practice in."*

*"This is an awesome tool as we do not get too many opportunities to be involved in scenes in a rural area. While this is not first-hand experience, it at least got me thinking on track"*

-Students from the Justice Institute of B.C.

The LOGIC application has the potential for transforming the way we deliver case studies online. It addresses an important need to engage students in applied learning and prepare them for situations they will meet in real life.

The LOGIC application was built following our observations of how instructors and students actually go about using case studies in teaching and learning. Feedback from instructors and learners at the Justice Institute of B.C. has been overwhelmingly positive. Instructors have found it easy to put together branching case studies and learners have found the content produced to be fun, interactive and engaging.

Our conclusion is that LOGIC represents a huge step forward in allowing instructors, without any specialist technical skills, to put together multi-media, branching case studies that will work on any platform.

## Further Information

Further information about the LOGIC application is available on the LOGIC website, [www.logicproject.ca](http://www.logicproject.ca) or contact Roger Mundell:

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## Author Information

### Dr Cathy Key

*"All things considered, it is faster and easier to create interfaces that complement human behavior than wait for evolution to adapt our brains to the idiosyncrasies of computers."*

With a Ph.D. in Anthropology, Cathy is fascinated by how people interact with applications and how technology can be used to facilitate teaching and learning. Her skills in designing educational applications are grounded in 7 years of teaching Anthropology at University College London.

Cathy is an accomplished Action Script programmer and has been designing educational applications in Flash since 1998. She works primarily with her partner, Madhu Bolton, an interface designer. Between them they have created dozens of Flash applications which meet their three main criteria.

*"Educational applications must be fun, easy to use and engage the student in a deep learning experience."*

You can contact Cathy at [ckey@mcomi.com](mailto:ckey@mcomi.com)

### Roger Mundell

Roger Mundell is the Director of Technology Transfer & Innovation at Royal Roads University. He joined the University in 1997, after a 30 year career as an entrepreneur and CEO of technology companies. Royal Roads University has an annual enrollment of approximately 2000 mid career learners, (average age, 39) who take intensive two year programs involving a short physical residency at the University each year followed by ten months per year of online coursework.

Roger and his team have been responsible for developing and deploying several highly innovative authoring and management tools for elearning. His team has won a number of awards for innovation, and he has been personally recognized by organizations such as Macromedia, Microsoft, The Government of BC, Converge magazine, The Stockholm Challenge award, DigitalEve, Viatec, and others, for leadership and innovation in online learning technologies and pedagogies (andragogies).

Roger has appeared as an invited speaker at many elearning conferences around the world, and serves on eLearning committees and advisory boards at the Provincial, National, and International Levels. He is also currently serving as the Vice President of ELearning BC, an Industry organization representing 70 vendors in the eLearning sector.

## References

Heins, T. and Himes, F. (2002): Creating Learning Objects with Macromedia Flash MX Resources: The Landscape of Online Learning is Changing. Available at <http://macromedia.com>

The Masie Center (2002): Making Sense of Learning Specifications and Standards: A decision maker's guide to their adoption. Available at <http://www.masie.com/standards>.

Muzio, J., Heins, T. and Mundell, R. (2001): Experiences with Reusable Learning Objects: From Theory to Practice. Victoria, B.C: Centre for Economic Development and Applied Research (CEDAR), Royal Roads University. Available at [http://www.cedarlearning.com/CL/elo.eLearning Objects\)sml.pdf](http://www.cedarlearning.com/CL/elo.eLearning Objects)sml.pdf)

Perfetti, C. and Spool, J.M. (2002): Macromedia Flash: A New Hope for Web Applications. Available at [www.uie.com](http://www.uie.com)