

TAKING ITS EDUCATION ON-LINE

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SUMMARY

The Consortium for ITS Training and Education (CITE) has launched the first web-based distance learning course on ITS. The course, titled “Fundamentals of ITS and Traffic Management,” consists of 11 distinct modules on various topics important in the careers of ITS professionals. This course is the first of many interactive web-based courses that will be developed. This paper reviews the course and its development process, and provides a summary of the lessons learned that will be applied to future CITE courses.

THE DEVELOPMENT OF A WEB-BASED COURSE

Web-Based Instruction

The unique aspect of CITE courses is that all of its courses are being designed in an interactive web-based format. “Interactive” means that the course includes a stimulating mix of participatory activities such as self study quizzes and exercises, drag and drop exercises, crossword puzzles or jeopardy games. These activities are used to support and reinforce the text-based information. The “web-based format” permits courses to be accessed via the Internet, anytime and from anywhere. This provides the student with the flexibility to work on the course at convenient times and locations.

The Course

The “Fundamentals of ITS and Traffic Management” course consists of 11 distinct modules on various topics important in the careers of ITS professionals. A complete list of modules can be seen in Table 1.

This course was designed as a gateway course to give students a broad knowledge or a complete picture of ITS. The course goes beyond the awareness level in each topic area but is not designed to make the students an expert in any one topic. Breadth vs depth was a major issue in deciding what course should be developed first. Overall, CITE members felt that this gateway course was a necessary first step. Future CITE courses will provide additional depth in each subject area.

Course Development Process

The steps in the course development process and the schedule followed are illustrated in Figure 1. Below is a detailed description of each step in the development process.

Step 1: Course Selection

In November 1998, CITE members met and listed the ITS courses that they currently teach. Most universities that offered ITS courses at all had an Introduction to ITS course. The group felt it was best to begin with the development of a distance learning course where the content was already developed. Thus, CITE's first course was to be a two-semester "Introduction to ITS" series. Future CITE courses would expand upon the many topics that would be covered in the Introduction course.

Step 2: Syllabus Development

The CITE Curriculum Committee was tasked to develop a draft syllabus for the two-semester Introduction to ITS series and present it to the CITE membership. During the process, the group reviewed the syllabuses of the existing ITS courses being taught by CITE members. An initial draft was developed in January 1999, circulated among the committee members; edited; re-circulated and reedited. A final draft was presented to the full CITE membership in February 1999 and was finalized a few weeks following the meeting.

Step 3: Selection of Authors

Once the syllabus was approved by CITE members, authors were selected for each module based on their area of expertise. Whenever possible, the author selected for a specific module was currently teaching the subject or had written recent publications on the subject. Fourteen faculty members from ten different universities were selected as module authors for the two semester sequence. An agreement was signed with each author giving them deadlines and requirements for content submission.

Step 4: Content Development and Review

Authors were asked to develop and submit module objectives and outlines for review by the full CITE membership. A review of the outlines took place during the April 1999 meeting yielded limited results. Instead, a subgroup of the Curriculum Committee met in May 1999

and performed a complete review of each outline and its objectives. Results of the meeting were quite different than what was expected. It turned out that there was quite a bit of duplication between modules. The group ended up revising many of the module outlines, combining several of them together, cutting one module and adding another. The biggest result of the meeting was the reshuffling of the modules into two distinct courses: “Fundamentals of ITS and Traffic Management” and “ITS Applications and Management.” These results were circulated to the Curriculum Committee for review. After some negotiating, the final syllabi for the two courses were finalized in early June 1999. At that point, authors were given feedback on their outlines and asked to begin development of the text.

Authors began submitting electronic files containing text, graphics, and quizzes/exercises to CITE in July 1999. Some of the text was submitted on schedule, however, most trickled in over the next six months. Once the text was received by the authors, it was sent out to a content expert for review. If any changes needed to be made, the author was contacted and revised text was re-submitted to CITE.

Step 5: Translation into Web-based format

Occurring simultaneously to the content development step discussed above, one module was pushed ahead in the web-based development process. The goal was to work out any kinks in the web-based development process prior to all the other modules needing to be translated at once. From May through September 1999, CITE worked with an instructional design firm to develop a standard look and process that would be used to translate all the other modules. This step was very painful, but very useful!

In September 1999, CITE contracted with the instructional design firm to translate the material delivered by all the other authors into the web-based distance learning format. The basis for each module was the text, graphics and exercises submitted by each author. The basic text was interspersed with various interactive screens to keep the students’ minds actively engaged. These screens include: interactions that require the student to drag and drop items in buckets or that require the student to move their mouse over the picture to discover more information, web searching exercises, self study quizzes that provide feedback for wrong answers, crossword puzzles and Jeopardy games.

Step 6: On-line Review

As the modules were posted on the Internet, CITE and the authors reviewed each module for the following: to make sure the content flowed well and nothing was missing, the interactions were appropriate and accurate, the quizzes worked properly and were placed correctly and the graphics were accurate, of good quality and were placed correctly. Both CITE and the authors submitted edits that were then corrected by the contractor. These edits were completed on each module prior to their release to the pilot course.

Step 7: Pilot Course

A pilot version of the course began in January 2000 and was completed in May 2000. Two sessions of the course were offered simultaneously. Session one consisted of 20 graduate students from the University of Toronto and Rensselaer Polytechnic Institute. These students received graduate level credit from their university for taking the course. Session two was made up of 51 participants from state DOT's, toll authorities, the private sector, FHWA, graduate students from several universities, and a few others from various public entities.

The pilot version was offered fee of charge by CITE. Normal university fees applied for the students taking the course for graduate level credit from their universities. All course participants agreed to complete and submit an anonymous evaluation form for each module and the course overall. The evaluations received were used to identify or determine the following:

- any technology problems and/or system changes that should be made for better course presentation and functionality,
- that the content flowed smoothly and was valuable to the students,
- if the module content was meeting its stated objectives,
- that all the outside web links were valuable and working properly,
- if the exams adequately tested their knowledge of the material and questions were not ambiguous,
- what students liked and disliked about each module,
- an average time to take each module, and
- if the course administration tool was useful and user friendly.

WebCT was used to administer the course. The software provides all the tools needed to offer an on-line course. Some of these tools include:

- Testing – a mechanism to offer, track, grade and provide immediate results for all exams,
- Evaluation - a method to track and summarize comments received from the anonymous surveys,
- Course Content - a mechanism to release course modules on a specific schedule
- Communication – a way for the instructor to communicate with students through announcements or a bulletin board, a way for the students to communicate with each other through a bulletin board or an e-mail listing of all other students,
- Grades – a mechanism for students to view all their grades to date, a way to calculate final grades, a way for the instructor to make any corrections to grades

Feedback received from the pilot was excellent! Constructive comments were used to make modifications to the overall course and each module individually. Some of the positive feedback is listed in Table 2.

Step 8: Final Editing

After each module was completed by the students, a summary of the evaluation forms was summarized and reviewed. At the same time that the students were taking the course, CITE had content experts review the on-line modules as well. Final edits to the course were completed based on the feedback received from the students and the content experts.

Step 9: Completed Course

The completed version of the full course has been finalized and is being offered by CITE for continuing education credits beginning in September 2000. As of June 2000, the course was available free of charge to all CITE member universities to offer in whole as a graduate level course or in part as a supplement to an existing course.

The entire course has also been broken up and each of the modules is being offered as its own individual training course. CITE began offering them for continuing education units in June 2000.

LESSONS LEARNED TO DATE

CITE has lessons learned in two categories: one set from the pilot course and one set from the course development process.

Lessons Learned from the Pilot Course:

- University students work best on a strict schedule. Each module and exam should be offered for a specific period of time and then the exam taken away. If students do not complete the exam on schedule, they get a zero for that piece of their grade.
- For University students, the on-line course works best if it is supplemented with an overall class project that brings all the material presented in the modules together. A class project is not recommended for current professionals.
- For most current professionals, a full semester course is much too demanding. The time commitment to take a full semester course is significant. Most current professionals are balancing work with its many deadlines with their home life and its own commitments. Each module takes between 4 and 14 hours to complete and that is a significant amount of time to find in their schedule each week. Unless the professional is seeking a graduate degree, most would prefer to take specific individual modules, thus the reason for CITE to offer each module as an individual training course.

- Testing is the hardest part of the course and very important to the students. Testing is somewhat limited on-line and thus, it is important to avoid ambiguous questions. Also, it is important to define any answer parameters in the question.
- It is very important to offer as much course instruction as possible up front. Based on comments from the pilot course, CITE has developed a list of frequently asked questions (and answers) that will be given to all future students.

Lessons Learned from the Course Development Process:

- Authors should supply their text and exercises for the course in a PowerPoint presentation with the graphics or photos referenced in the file. The expanded version of the text should be included in the notes. One slide is like one page of a course. Having the graphics and photos referenced in the PowerPoint file shows the instructional designer their exact placement.
- Graphics should also be submitted separately in .gif format for better viewing on the Internet. Pulling graphics and photos out of an existing file can cause them to become illegible or unclear on the internet.
- Developing the text for a web-based distance learning course requires much more detail than preparing notes for a lecture course. Students do not have the benefit of the instructor speaking to them. Answers to all possible questions needs to be worked into the text presented.
- Outline exactly what you expect from your authors. Give them specifics as to the format of the information you expect from them and the deadlines.
- Authors should review a current on-line course before developing the text, exercises and graphics for their course. CITE did not have the benefit of this since there were no other courses like what we wanted to develop.
- As with software contracts, contracts with subcontractors should contain design documents and be very specific about deliverables and ownership.
- The subcontractor should be in charge of all graphics once they are initially received from the author.
- Interactions and self study quizzes/exercises should be well dispersed throughout each module to break up text screens and have the students apply what they have learned thus far.
- All self study quizzes should have feedback when a question is missed. When a student completes a self study quiz, it is optimal to list the question again, give their answer,

give the correct answer and give feedback for each question. Students do not want to have to go back and see what the question was or have to remember each of their answers.

- Know where you are going to host the completed course before you develop it.
- Obtain specifics on what software will be used to develop the course.
- Allow more time for everything than you think you need.
- Always keep in mind the speed at which your students will download the material you are presenting. Always design for the slowest computer (within reason). Set up criteria for what you consider the minimum requirements.

CONCLUSION

The development of an interactive web-based distance learning course is much harder and more costly than CITE initially anticipated. This paper explains and documents the process that CITE went through in order to develop its first course. Now that CITE has completed this first course, applying the lessons learned will make the completion of the next course much easier and much less time consuming. CITE plans to expand its course offerings in the very near future. The amount of expansion will depend on the funding that is received from offering the full semester course and the individual modules as training courses.

ACKNOWLEDGEMENTS

The I-95 Corridor Coalition provided the seed funding that initiated CITE. The Coalition is a regional partnership of transportation agencies from Maine to Virginia, bringing its members together to address ITS solutions to shared transportation problems and challenges. By leveraging resources, sharing information and coordinating programs, the Coalition adds value to the activities of its members. The Coalition provided the seed funding for CITE recognizing that CITE had two key benefits to offer its members. First, CITE offers Coalition members a convenient way to provide ITS training to current employees. Second, CITE facilitates graduate level ITS education for potential new employees.

CITE is being managed by the Center for Advanced Transportation Technology at the University of Maryland. Phil Tarnoff is serving as the Director and Kathleen Frankle is serving as the Manager.

Table 1

FUNDAMENTALS OF ITS AND TRAFFIC MANAGEMENT			
MODULE	TOPIC	HOURS	AUTHOR
1	Introduction to ITS, User Services and Functions	4	Anthony Saka Morgan State University
2	Traffic Flow Theory as Applied to ITS	8	C.Stamatiadis University of Massachusetts, Lowell
3	Introduction to Telecommunications Technology	8	Jeff Adler Rensselaer Polytechnic Institute
4	Introduction to Information Technology	14	Manuel Rosetti University of Arkansas and William Scherer University of Virginia
5	Interoperability: ITS System Architecture and Standards	8	Philip Tarnoff University of Maryland
6	Transportation Management	6	Brian Smith University of Virginia
7	The Tools of Advanced Transportation Management Systems (VMS, HAR, sensors, displays, controllers)	8	Harry Teng Polytechnic University
8	Incident Management and Emergency Management	8	Harry Teng Polytechnic University
9	Corridor Management including Ramp Metering and Traffic Control Centers	14	Antoine Hobeika, Virginia Tech Nathan Gartner University of Massachusetts, Lowell
10	Dynamic Route Guidance and In-vehicle Systems	8	Jeff Adler Rensselaer Polytechnic Institute
11	Traffic Signal Systems Fundamentals	8	Nathan Gartner University of Massachusetts, Lowell
	TOTAL HOURS	94	

Table 2. Positive Feedback from Pilot Course

It was a generally comprehensive introductory overview of ITS and contained material you would need to take several courses (or read a rather extensive reading list) to gain exposure to.
The course contents were quite extensive, yet it seems every effort has been made to frame the course to its best presentation. It was pretty straightforward to deal with all the stages of the course.
The freedom to do things when I had time.
It's very interesting course material that will have real applications in the present and future.
This course covered a lot more than a classroom course would have covered. It also enabled you to proceed at your own speed (more or less) but encouraged/required you to become exposed to many subjects (a good thing). Good luck with the future!!
This is an excellent effort and I gained a lot from this course.
Thanks for providing this distance learning course. It was really useful and interesting to me.
Overall, it was a very good experience for me and the course was really good that added a great value to my knowledge. I think you should go ahead and offer some more courses like this one.
Overall, it is a valuable learning experience and provides a lot of information for future applications. Thanks.
Very good introduction course to ITS.
It was good and helpful course for me. Thanks.
On the whole, The course was conducted in the best possible fashion. I would always remember the time I spent on this course (in good sense of course) and I thank all of you who worked on it and at times helped me.
This course had a lot of interesting material. This course gave me a grasp on what ITS and its concepts are all about.

Figure 1. Course Development Process and Schedule

