'ENGAGEMENT BY DISTANCE'
A DISTANCE DELIVERY METHOD MAXIMIZING STUDENT ENGAGEMENT

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ABSTRACT

Distance delivery of courses is a concept that is well entrenched in history but has been driven by the technology of the era. The notes and books that were once sent by post have given way to the electronic and digital reality of communicating today. However with the switch to digital communications, new tools and techniques have arisen that empower us as educators to deliver courses as never before. This results in a teaching and learning experience that is closer to being in an actual classroom with an instructor than ever before.

Taking advantage of these new tools, the authors have been developing a distance teaching and learning methodology whereby learners are actively engaged and challenged in an online setting while learning course content. This is achieved by delivering content in a secure virtual learning environment using Flash or HTML5 videos that are interactive, periodically pausing during the delivery of information to ask questions as the instructor would in a classroom.

Assessments are performed as would be done in a classroom setting as well, but distributed to the students electronically and created using software that randomly varies the parameters in the questions such that each student receives a unique version of the assignment. In addition the assignments are marked instantaneously which also seems to increase engagement.

The authors have learned through experience that for many students, even during an asynchronous course, it is necessary to have some synchronous interaction with the course facilitator. We have developed a novel method for 'distance tutoring' which involves audio and visual interaction as well as the use of a whiteboard style application for the facilitator to draw diagrams and demonstrate calculations or other course content as appropriate.

To this point the focus of the paper is on devices employed in distance delivery, but there are two different methods the authors use to employ these devices and deliver effective courses by distance. These are the 'Bubble Method' and 'Master Method' and are described fully at this juncture.

The final piece to the puzzle is the method of evaluation in the form of tests and examinations. This paper will conclude by describing the network that is used by the Marine Institute as part of Memorial University of Newfoundland for delivering invigilated tests and examinations to students all over the world.

Keywords: *Student Engagement, Distance Delivery, etc.*

1. INTRODUCTION

Teaching is communicating. In its simplest form, the bare minimum for communication is that there is a sender, a receiver and a message. This bare minimum covers the delivery of information, but teaching requires more. As well as providing information there must be understanding that is instilled in the student. It is ensuring that this understanding has taken place that is critical to effective teaching. Ironically, it is this very element that distance education has not accomplished well. Since the use of the written word, information has been passed by distance. How we achieve this in the form of distance delivery and evaluation of course material is inherently tied to the tools for communicating that we have at our disposal and how we use them.

"Advances in technology have powered pragmatic shifts in education" (Frick, 1991). Through history it can be noted how the evolution of distance delivery of courses kept pace with the evolution of technologies employed in those deliveries.

In the early 1900's correspondence courses were quite common from post-secondary institutions. The acceptance of this delivery method for courses grew to the point where a National University Extension Association (NUEA) was created to deal with such issues as new pedagogical models and national level guidelines such as university policies regarding acceptance of credit from correspondence courses, credit transfers, and standard quality for correspondence educators.

Watkins (1991) cited that Vincent (1885) wrote:

> "the day is coming when the work done by correspondence will be greater in amount than that done in the classrooms of our academics and colleges; when the students who shall recite by correspondence will far outnumber those who make oral recitations."

The United States federal government granted radio broadcasting licenses to 202 colleges, universities and school boards in the period between the world wars (1918-1946) in support of evolving distance learning methods. In spite of this, by 1941 there was only one college level course offered by radio, and this course failed to attract any students (Atkins 1991).

After struggling to gain acceptance by academics, Educational television followed in the mid-20th century and was greeted with significantly greater success. The

perceived challenge to this point was in the dissemination or distribution of the knowledge. The authors believe that the actual obstacle to widespread acceptance and success of distance learning was in the lack of being able to receive information from the students and to truly engage them in the delivery and evaluation of the course material.

The definition of what is precisely meant by student engagement is one that is ongoing in academic circles. We know that it is something that we wish to occur as it results in a student investing his or herself into the material that is being delivered and the course exercises presented. It has been shown to overlap but not be synonymous with student motivation (Sharan et al. 1999).

The authors believe that student engagement, however it is defined, can be achieved by virtue of delivering the content to the learner, querying the student to ensure that the message has been received, and then rewarding the student for their successful learning of the content. The more active this type of exchange is, the better the student engagement.

The advent of the internet opened new possibilities by permitting course facilitators to not only deliver course content but to asynchronously communicate back and forth with learners in a much more timely fashion. The authors have developed a teaching strategy employing four key elements which are intended to maximize student engagement and success. These four elements include:

- Course Content
- Problem Solving
- Distance/E-Tutoring
- Course Management

The remainder of this paper describes the elements of this distance delivery method.

2. COURSE CONTENT

When many students are asked if they are interested in taking a course either by distance or face to face, most students assertively indicate that they greatly prefer to be in a classroom taking a course from the instructor. When I ask them why this is the case, they almost always say that they learn better when in a classroom.

When the authors first started the development of their online teaching methodology, we had experience teaching courses by distance and were familiar with the traditional challenges faced by both the learners enrolled in the course as well being the facilitator of such a course. With this in mind, it was intended to create an online delivery method that was asynchronous yet mimicking as closely as possible the course delivery experience achieved in a classroom setting.

Content was prepared and delivered using a digital video format. Essentially, a movie was created representing each lecture of the course. These were made accessible to the students using a virtual learning environment and had DVD style controls embedded in the 'Flash' video script which permitted students to start, pause, stop, rewind and fast forward the video as you would any movie.

Worksheets were also made available that were 'incomplete' sets of notes. Students were informed that they had the option of printing these for use while watching the video lectures to assist them in taking a complete set of notes while still requiring them to participate in note taking. Typically these notes have extended text and some complicated drawings on them and appropriate spaces for the student to make notes and create a complete set of course notes for themselves.

The envisioned concept was that students would have either paper for note taking or a set of worksheets with them at a desk while watching and listening to the video lecture on a computer or other appropriate device. The ability to pause and rewind the lecture facilitated course participation in the traditional sense and permitted the asynchronous element of the lecture to occur.

Reflecting on the correlation between video lectures and a typical in class delivery to a group of students, the authors were pleased that the students had the opportunity to read the written notes as they were presented in class, to hear the words spoken by the instructor and to take notes as they would in a traditional classroom. What was missing was the opportunity for the faculty member to periodically look at the students and gauge how they felt about receiving that material, and, should any doubts arise, ask such questions as "what does what I just said mean?" or "how do you do this?".

The answer was to change the video format and embed within it a series of 'engagement questions'. To this point the video lectures simply progressed chronologically. What the authors did was to every so often have the video stop and ask the student a question. With the use of Flash/HTML5, a question is orated by the faculty member to the student watching the video lecture and an answer field appears. The video remains paused until the student submits an answer. It is the choice of the instructor as to whether or not the video progresses based on the quality of the student response, but the sum total of the student responses is captured, assessed and recorded.

The authors do not create these questions such that they are of a level and scope as the questions the students might see in a take home assignment or test. The questions are typically relatively simple questions based on the content received immediately prior to the video question prompt.

As an example, an engagement question used in a video lecture from the course 'Transport Canada Applied Mechanics for Marine Engineers' which follows the introduction of the concept of a vector would be:

Considering the vector diagram in Figure 1, add the parallel forces represented by vectors A, B and C.

| $\vec{A}$ | 5N |
| $\vec{B}$ | 10N |
| $\vec{C}$ | 3N |
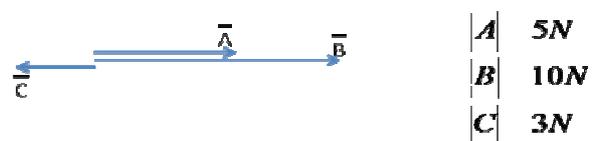
Figure 1 Vector Diagram for Sample Question

The question tests the concept yet is readily solved with minimal time.

By virtue of this in-line video quizzing, the faculty member is able to assess student participation in the actual lecture. Should the faculty member choose, they may award a participation grade to the student based on the results of these nested video quizzes.

3. PROBLEM SOLVING

Homework assignments, quizzes, tests and exams are a standard part of almost any in class delivery. Discussions do take place that require higher levels of consideration on the part of the students and when the material lends itself to written interpretation, papers may also be requested to be written.

The authors teach mechanical engineering courses at the Marine Institute which typically have an applied mathematics and fundamental knowledge basis. Take home assignments and in class tests and exams are commonplace in these courses and the instructors have created a database of questions for each of their courses using a software called MapleT.A. (Cross and Tucker, 2012).This software algorithmically generates assignments for students ensuring that each student receives a unique assignment to them which covers the material being taught in that section of the course. The ability to simply get the answer from a peer is no longer a viable option and now the student must work out problems on their own.

Additionally, feedback is instant. As soon as the student submits an assignment they are able to receive immediate feedback as to how they performed as well as a fully worked out solution customized to their version of the assignment. Once an assignment has been submitted and a final grade achieved, the quiz questions (where appropriate) are made available as randomly and algorithmically generated practice problems, giving the student access to a massive number of sample problems with fully worked out solutions for the student to use in preparing him or herself for tests or final examinations.

The engagement element is satisfied by virtue of the instant response when submitting answers to any of these questions as to how they did and the fully worked out solution. Engagement requires interaction and the more immediate, personalized and responsive the interaction, the greater the student stimulus and engagement. Young people today live in a society where instantaneous communication through social networking and instantaneous feedback through gaming are prevalent. They are conditioned to expect very short response times to queries, and as a consequence tend to lose interest when the response times are in the order of days rather than minutes.

Quick response times are typically not achieved by the traditional educational system and course evaluation methods. In this way this method of inserting problem solving practice problems and evaluations into either courses delivered by distance of face-to-face is an evolution that is in keeping with the evolution of young people today.

4. DISTANCE/E-TUTORING

The distance courses delivered by the authors are to a diverse group of students with a broad background spectrum. Based on the full history of the authors in delivering courses by distance, most of the students who enrol for these courses are highly motivated and wish to do well. A relatively small portion of this group are fully capable of doing well with minimal engagement or interaction by the faculty member but there are also a group who required more personal, one-on-one and synchronous engagement in the form of personal tutelage.

This was initially a bit of a stumbling block as it was counter to the concept of delivering courses by distance. Many of our students live and work a great distance away from the Marine Institute where the instructors maintain their offices. Some of them live in other countries or overseas. Also, based on the mathematical nature of this material, voice communications or typing was not adequate. Equation editors were useful, but slow and cumbersome to use.

Figure 2eInstructionInterwrite Tablet and Pen

The solution was to merge two technologies into a single tutoring solution. The authors obtained a device called an "eInstructionInterwrite Tablet and Pen". This tablet, which is about the size of a mouse pad, works electronically with the pen to transfer what is written to the computer screen. It allows the instructor the ability to use the tablet and pen while working on a whiteboard online – instead of clicking on a computer's mouse and
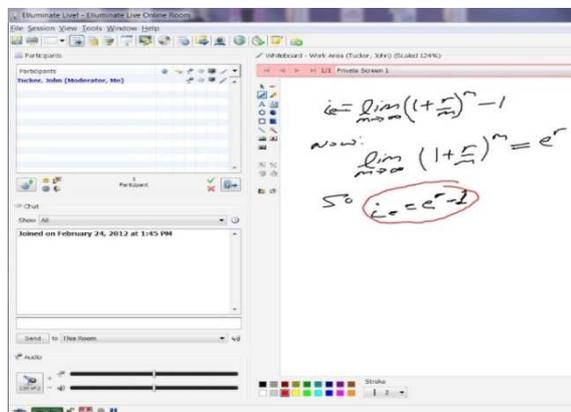
Figure 3Elluminate Live

struggling to draw or write mathematical symbols.

This device was married with a web conferencing software called "Elluminate Live" (Elive) (Figure 3). Elive is a software that uses voice over IP and teleconferencing, public and private chat, quizzing and polling, emoticons, and a webcam tool. It permits the faculty member to teleconference with their students synchronously, but for the authors purposes the most important function it performs is to enable the instructor to show the students an application that they are running on their computer.

When a student requests a synchronous tutoring session, the faculty member and the student agree on a mutually agreeable time and the student joins a video chat session (much like you can have with SKYPE) that is set up by the instructor. They can chat and speak to each other using the webcam. In addition, the faculty member shares a whiteboard application on their desktop which is viewed in real time by the student such as is shown in the diagram to the right.

The student and the faculty member chat in real time while the instructor can write 'on the board' as they would write on a notepad or chalk board in a face-to-face tutoring session. Additionally, you can have group sessions where the entire class is able to participate in such a session asking questions and having the instructor answer them.

In this way, the authors have introduced a true face-to-face feel and the associated level of engagement into a distance course delivery.

5. DELIVERY METHOD/PHILOSOPHY

There are two teaching methods (or philosophies) that the instructors have employed in delivering online courses.

Which method is employed depends on the program in which the course is delivered or the nature of the course as well as the learners.

5.1 The Bubble Method:

The instructors entitle the first method of delivery the 'Bubble Method'. This method has been used and found highly effective in the delivery of courses to students in a standard timeframe such as a semesterized program. The duration of the course may vary, but the key element is that the course itself has a specific start and end date. The course itself is scheduled completely within the time frame of the start and end date, and all students who participate in this course must adhere to these externally applied scheduling constraints.

In addition to the start and end date, additional scheduled events are set prior to the course start. These include:
- The release date and time of each video lecture;
- The start and due date and time for each course work assignment; and
- The scheduled date and time of each test and exam for the course.

This degree of scheduling is typical in the courses taught by the instructors, but the Bubble Method arose as a result of a series of uncontrolled circumstances.

The initial offering of a particular course by distance was assigned to the instructor a very short time before the course was scheduled to begin. During this first offering the instructor was busily preparing PowerPoint files, writing notes and recording files while teaching other courses as well as performing research duties. It was a struggle to just stay ahead of the students with respect to production of the lecture videos and release of these lectures in accordance with the posted schedule.

The outcome was asurprisingly innovative approach with hugely successful results. Originally, the lectures could only be made available as fast as they could be authored, resulting in students having to wait on the release of these videos and not being able to forge ahead with the course material. Additionally, the release dates for the assignments and their associated deadlines were set at the course start, resulting in the students being forced to work through the information at more or less the same time and as a group.

The progress of the vast majority of the course participants was generally within a week to ten days of the posted schedule with respect to viewing video lectures, submission of assignment questions and reviewing course discussion board postings. Intelligent questions and answers were posted in the discussion boards and everyone began collaborating on learning the same material. The discussion boards were alive with activity and no one was feeling intimidated by keen students who had worked ahead through the curriculum.

This concept of keeping the students in a "time bubble" as a method of teaching provided a greater sense of community and collaboration in the course than the instructors had seen in past offerings. This concept occurs naturally in classroom deliveries, but now the instructors are able to emulate this similar environment in distance deliveries. In short, student satisfaction was up, complaints were down.

5.2 The Mastery Method:

The second method of delivery is one that was contrived with intent. The authors desired to create a system where content was released to the learners in a controlled fashion as the course participant demonstrated that pre-requisite knowledge had been learned. Additionally, it was intended that learners could completely operate on their own timings for the course (with the possible exception of a generous overall duration) thus being able to fulfil the requirements of the course in order but at their own pace.

The solution was to utilize the results of the engagement questions described in section 2 of this paper. The results of these nested video quizzes are utilized as a form of closed loop feedback to control the rate of content release to the learner. A flow chart of the logic employed in the mastery method of distance delivery is presented as Figure 3.
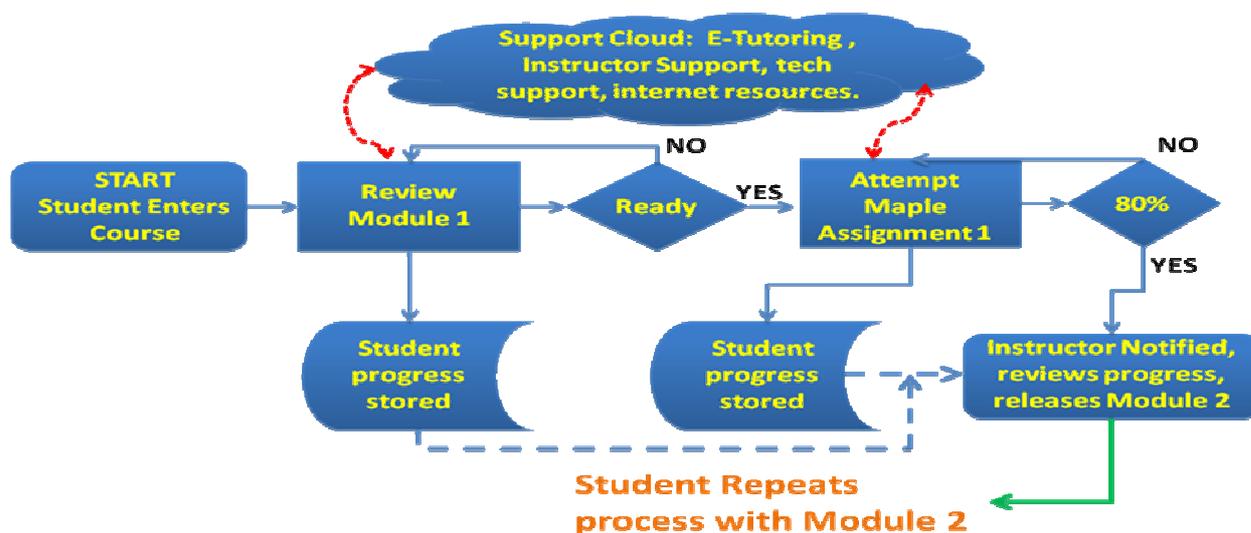
Figure 4 Flowchart of the mastery method of distance delivery

The above flowchart indicates the process whereby a learner in a mastery mode course would enter the module (be it at the start of the course or from a previous module) and gain access to the subsequent module. When a course participant first joins the course, the only content that is visible and accessible is the first module.

Upon gaining access to the video lecture (Module 1 in the flowchart of Figure 3), the student would review the module and answer the engagement questions nested in the video. Rules such as whether or not course participants are permitted to move back and forth in the lecture or re-answer questions can be customized to the course facilitators' preference.

Once the student has completed the module, the results from the nested quiz in module 1 are automatically input into the Learner Management System (LMS) grade system where a check is performed. If the grade is satisfactory, then a set of assignment questions are made available to the learner. The learner must then work through the question assignment and achieve a satisfactory grade(80% in the case of the flowchart of Figure 3) before they gain access to the next module of the course and are permitted to move on.

Through this entire process, support is available to the course participant in the form of E-Tutoring (described in Section 4), technical support as well as internet resources which are provided by the course facilitator and may also be searched by the course participant.

Student progress in the video lecture as well as the question assignment are automatically stored in the LMS using automatically, and the instructor receives email notifications indicating student progress through the various modules.

The net result of the application of this method is that learners have the opportunity to join the course at any point in time and work through the material in a sequential fashion at their own pace, proceeding only when they have demonstrated mastery of the subject.

6.   INVIGILATED TESTING/EXAMINING

The Marine Institute of Memorial University of Newfoundland is governed by the rules established by the university senate and as are laid out in the MUN calendar. At this time MUN does not permit the administration of electronic tests or final examinations to students registered in MUN courses.

The technology to safely and securely administer a test or examination remotely is in a fledgling state, and the authors are working on methods to administer tests of this type to e-learners remotely.

The policy at this time is that tests and examinations are delivered in an invigilated fashion. To facilitate students taking courses by distance, Distance Education, Learning and Teaching Support (DELTS) of MUN have established a set of examination centres and a protocol for delivering tests and examinations to students participating in courses delivered by distance.

Agreements have been established with universities and colleges throughout Canada to be considered as examination centres for MUN. When a student registers in a program at MUN and signs up for a course, they also register a location as a residence for the course period. The participant is automatically registered to write or perform any invigilated evaluations at the nearest examination centre to their registered residence location.

A student scheduled to sit for an invigilated evaluation may request to have their evaluation administered at any examination centre up to two weeks prior to the scheduled evaluation.

Should the course participants residence be greater than 70 km from the nearest examination centre, then DELTS has a list of criteria for what constitutes an acceptable invigilator. It is the examinees' responsibility to identify an invigilator, and DELTS then negotiates a contract for a nominal fee for the examiner to administer the evaluation to the student at their remote location.

7. CONCLUSIONS

Engagement of course participants in a classroom setting and face-to-face is something that we as faculty have developed personal mechanisms to ensure. Regardless of the individual idiosyncrosies that any lecturer may employ, engagement of the learner occurs and is confirmed by virtue of communication, verbal or otherwise between the course facilitator and the participant.

The devices and methods that the authors employ in delivering courses by distance facilitate a distance delivery in which faculty can use their personal style and mechanisms to engage the learners as fully as possible.

This paper focuses on the devices used which include video lectures for the delivery of course content, algorithmic on-line quizzing softwarefor the delivery of assignment questions an possibly quizzes or examination, technology for E-tutoring which would typically be a synchronous interaction between the facilitator and the learner, and two different methods for employing these devices in an on-line delivery.

As to the actual interaction that occurs between course facilitator and participant or between the participants, how that happens and the nature of that event depends on too many variables to be explored in this paper.

Peter Drucker, a writer, management consultant and self-described social ecologist wrote (Druker 1992):

"Teaching is the only major occupation of man for which we have not yet developed tools that make an average person capable of competence and performance. In teaching we rely on the "naturals," the ones who somehow know how to teach. "

The goal of the authors is to empower the naturals among us to teach by distance.

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