Web-based Instruction for Adult Professional Development and Continuing Education

By: Keith Prior

Introduction:

In the spirit of presenting alternative prevention practices, The EMT Group, Inc. will be presenting a series of editorials regarding new and promising methods of alcohol and other drug (AOD) prevention. This article is the third in the series. We hope you enjoy this discussion.

The purpose of this paper is to examine the prospects and possibilities in using web-based instruction for professional development. The specific case is applied to adult learners working in and with alcohol and other drug (AOD) prevention, treatment, and rehabilitation services.

Program effectiveness has shown to be correlated with consistent program content, delivery method, and coherence. Current staff turnover rates within AOD programs hinder the ability of programs to retain this consistency over time. Exploring the area of distance learning for the purpose of educating staff allows AOD programs to train their employees not only at their own convenience, but consistently across time which will lead to increased positive program outcomes. Programs engaged in on-going staff development through web-based instruction or tutorials ensure that all staff are receiving consistent, up-to-date information.

This report is informed by a variety of sources and resources. The general influences on this report come from:

- Investigations of distance learning designs within post-secondary education, and professional continuing education in the United States, the United Kingdom, Malaysia, and India.
- Work in and with instructional design in post-secondary education, specifically at the University of California, Davis Teaching Resources Center.

- Research and review of distance education with participants and researchers making presentations at various national conferences on distance education (most specifically those sponsored by Portland State University).
- Research on instructional design in the particular case of adapting instructional design to distance education applications with further refinements for adult continuation learners.

This report will briefly touch upon learning theories as they apply to the specific case of adult learners and/or conditions in which the medium of content transmission (the internet) limits interaction between the content provider (the trainer) and the learner. Particular emphasis is placed on learning theories that have been directly translated into practices appropriate for the conditions of adult continuing distance education learning.

The scope of this report is centered at the intersection of:

- Adult learners
- Continuing education for professional development
- Web-based instruction

The goal of this report is to provide the reader with sufficient knowledge about state-of-the-art research within these three domains to create an effective continuing education offering. The end of the report contains some suggestions for assessing learning that results from the web-based instructional designs recommended here.

This work is based on the expansion and extension of research carried out between 1993 and 1999 on behalf of the University of California, Davis/California State University, Fresno Joint Doctoral Program in Educational Leadership. This research focused on the specific means of delivering course content to a geographically distant student (learner) population.

- The primary sources for this inquiry are:
- A review of the literature;
- A Delphi group examination of the past, present and future of on-line education; and
- Twenty-seven interviews with practitioners and experts in the field of distance education.

Findings:

- Since the advent of on-line training and instruction, there has not been any comprehensive evaluation of the effectiveness of on-line instruction.
- There are no published or publicly available research reports on the intersection of on-line instruction for adult learners in professional development.
- Virtually all evaluation of on-line instruction has been focused on a single element of the utility (e.g., list servers, e-mail, web pages).

In general, the literature remains highly fragmented. There are hundreds of studies that encompass a single, particular segment of the enterprise that is on-line education.

The few attempts to broaden the evaluation of on-line instruction have been confounded by research design flaws, failures to adequately discriminate between instructional forms or modes, and small evaluation populations. Even those attempts to evaluate on-line instruction through quasi-experimental design or assessments of a shift from baseline knowledge have not sufficiently isolated the experimental condition from a control.

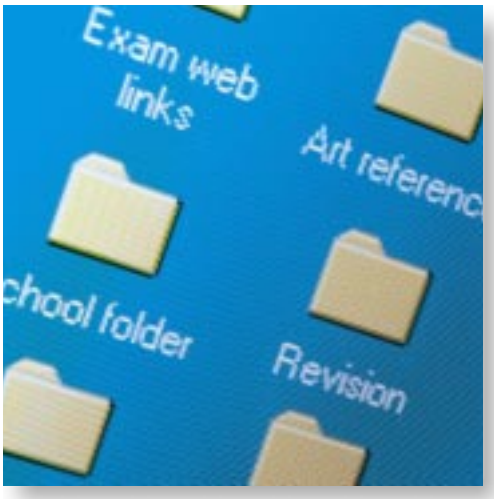
In Fall 2001 the initial literature reviews for the preparation and design of this program (1994 and 1998) were repeated with the specific focus on the population described above.

The most significant finding from this review of the literature is that there are no broad-based research studies on the efficacy of web-based instruction that are published or publicly available. This is surprising in light of the fact that in the course of three different distance education conferences held in Portland Oregon a large group of researchers and instructional designers met and discussed plans to carry out such research. The more than thirty people attending all three meetings outlined funding resources, discussed research methodologies, and began developing working relationships among the members of the group to carry out specific elements of the research.

In conversations with several of these individuals the following reasons were put forth for not completing the planned research activities:

- Institutional concerns about the extent to which the research findings might be employed by competing institutions to advance their own distance education services in a competitive marketplace.
- Institutional reallocation of research funding to support the development of the infrastructure to deliver the distance education services.
- Procedural constraints on the methodology resulting from the application of human subject protocols.

Two somewhat comprehensive and broad-based studies are known to exist as part of a private corporate holding by Westinghouse Learning Corporation and Arthur Anderson. IBM Corporation also has a substantial store of knowledge about the efficacy of different approaches to distance education.



MIT's development of its System Dynamics courses exhibits some characteristics of a content delivery system that has been refined by assessments of its efficacy (it is also an extremely expensive content delivery system).

Some of these assessments of on-line instruction are available in a limited form however, the course content is technical or mechanical (e.g., IBM's distance education courses in electrical engineering).

Findings:

- Successful on-line instruction (measured in terms of learner outcomes through exit examinations) for early adopters involved extensive enhancements and multiple interaction modes.
- The most successful instruction that depends entirely on web-based instruction receiving the best evaluations from participants are courses that enjoyed a complete re-configuration and redesign from the classroom to the web.
- Successful on-line instruction is designed to suit the culture of the learners. Learners in different discipline areas have their own unique cultures.
- Early on-line instruction adopters commonly applied some technology medium (list processors, discussion group software, web pages, e-mail) to the curriculum that had previously been delivered in person and in conventional classrooms or workshops. More recent additions to the curriculum continue to reflect this cultural habit.
- Early on-line instruction uniformly measured the medium's effectiveness by comparing exit examinations between conventional classrooms and on-line course participants. Such differences excluded variables such as learner motivation and forms of access (e.g., bandwidth), which are known to be important variables in adult learning.
- Early adopters found that on-line instruction was not a less expensive mode of delivery than conventional classrooms—the principal advantage was in reaching truly geographically distant learners.

In 1994, this author conducted a computer-based Delphi process to broadly examine the future of on-line education. The participants in this Delphi process (Delphi 1) were made up of faculty and instructional support staff from the nine University of California campuses, four private universities in California, three California Community Colleges, and five of the California State University system's campuses. The faculty and staff came from a wide array of academic disciplines. The essential purpose of Delphi I was to examine the possible futures for on-line instruction in the context of the post-secondary education role in California.

In October 2001, this author repeated the Delphi process (Delphi II) with four of the participants from Delphi I and additional participating faculty and staff from:

- Two private universities with extensive on-line experience;
- Four private proprietary corporations with distance education staff development budgets in excess of $1 million per year; and
- Three educational assessment staff within professional development and continuing education in professional fields.

THE DELPHI METHOD

Definition and Historical Background

The objective of most Delphi applications is the reliable and creative exploration of ideas or the production of suitable information for decision-making. Delphi represents a useful communication device among a group of experts and facilitates the formation of a group judgment. The Delphi Method as a monovariable exploration technique for forecasting. The Delphi method has been widely used to generate forecasts in technology, education, and other fields.

The Delphi Method

The Delphi method is an exercise in group communication among a panel of geographically dispersed experts. The technique allows experts to deal systematically with a complex problem or task. The essence of the technique is fairly straightforward. It comprises a series of questionnaires sent by electronic mail systems to a pre-selected group of experts. These questionnaires are designed to elicit and develop individual responses to the problems posed and to enable the experts to refine their views as the groups work progresses in accordance with the assigned task. The main point behind the Delphi method is to overcome the disadvantages of conventional committee action.

The following describes thirteen steps for the Delphi method:

1. Format the resources to undertake a Delphi on a given subject.
2. Select of a panel to participate in the exercise. The panelists are experts in the area under investigation.
3. Develop the first round Delphi questionnaire.
4. Test the questionnaire for proper wording (e.g., ambiguities, vagueness).
5. Send the first questionnaire to the group members.
6. Analyze of the first round responses.
7. Report the first round responses to the group.
8. Repeat the first round question if agreement is not reached.
9. If the repeated first round does not achieve consensus when the group members are informed of the comments and deliberations of their peers, then the round is reported as a group of responses or a binary response.
10. Prepare and test of the second round questionnaires.
11. Transmit the second round questionnaires to the group.
12. Analyze the second round responses (Steps 7 to 9 are reiterated as long as desired or necessary to achieve stability or divergence in the results).
13. Prepare a report by the analysis team to present the conclusions of the exercise.

In each round, the results are shared so that group members know the thinking of the whole.

The Delphi process provided numerous additional sources: some primary, and some secondary.

The group interaction in Delphi is typically anonymous, and this principle was employed in Delphi II with a difference: each of the Delphi group participants took on the persona of one of their idols or heroes. Some of the identities used were: Donald Schön, Countess Von Lovelace, John Dewey, Sarah Lawrence Lightfoot, and so on. The idea behind these false personas was to provide a vantage point that allowed the individual using the persona to establish a point of view defensible from the intellectual standpoint of an "other." In other words, the false persona allowed the individual to argue from their theological point of view without exposing their individual identity. At no point in Delphi II were these identities challenged.

Core Thinking

Delphi II came to complete agreement on several fundamental principles of web-based learning for the continuing education adult learner. First is the organization of the curricular offering. Second is the style of that offering. Third, and this is related to the possible modes of assessing learning, is the idea of general versus locally adaptive behaviors. This, in turn is related to the idea of constructing understanding. These principles are described in the specifications section.

On-Line Style

The style of on-line content can contribute to learner retention and recall. This is a variable that has not been given any significant importance in the assessment of web-based instruction. There are three principal reasons this topic has not enjoyed much attention. First, the rapid changes in the technologies that are applied to web-based instruction confound this research. Second, the forms in which the content is provided vary widely and do not fit typologies or types suitable for classification. Finally, there is a belief among on-line course providers that a dynamic system enjoys emerging technologies that enhance content and that such possibility of innovation precludes the setting of standards.

In 1993 and 1997, this author and Douglass James conducted studies to determine the ease of access, (to students) of the content delivered through web-based courses. Ease of access was determined through a user assessment of the on-line forms as well as an assessment of comprehension. A total of 280 graduate student informants were divided equally into experimental and control groups. Each of the two groups were composed of approximately two-thirds students fully-employed outside the institution where they were graduate students and one-third students whose employment was 20-hours per week or less. Control group subjects were offered on-line documents that were designed by a web-designer without any constraints other than that the content was to emulate the typical on-line course. Experimental subjects were given the same content constrained by the rules of mapping information that Robert Horn developed at Harvard and MIT (Horn, 1969). These rules are also known as "structured writing" and have influenced the documentation of computer systems and other highly structured domains of information.

Care was taken not to exclude any of the graphic enhancements in the mapped content that was present in the typical web content even though this frequently blurred the actual structure of the content.

The results of this study were striking: fully employed students viewed the mapped content as twice as accessible as the typical web content. Mean comprehension scores for experimental subjects were 1.3 standard deviations above that of the control subjects. This finding implies that quality content presentation and connection to the student is key to promoting information retention and integration into memory.

Findings:

- Appropriate instructional design for the audience and/or population is the most efficient path to effective on-line instructional offerings.
- A single medium of content delivery is not appropriate for all audiences.
- A single medium of content delivery is not appropriate for all on-line instruction.
- Participants in on-line instruction will not participate in subsequent courses that offer lower forms or amount of interaction with the content provider and/or teaching assistants or proctors.

On-line instruction that achieves high levels of content transfer and high levels of consumer satisfaction are substantial re-designs of successful classroom instructional practices.

Learning Goals: Locally-Adaptive and Generally-Adaptive Behaviors

In the language of course design, there are several dimensions that address the learning goals. This appears most frequently in continuing education and professional development circles in the question of outcomes for the learner.

I have tended to think of this and describe it as a range of outcomes that can be assessed. The range encompasses knowledge, attitudes, and behaviors (K-A-B) that fall between locally-adaptive and the generally-adaptive.

- The locally-adaptive K-A-B is case-specific and the shortcomings of this outcome goal can be seen in people who can solve a problem that they have previously experienced. This is often characterized in the educational literature as rote learning or drill.
- The generally-adaptive K-A-B is, as its name implies, more generalizable and allows the learner to apply K-A-B to new experiences, to assess different approaches, and to experiment and learn from the experiment.

In work on instructional design I have found that it is far more difficult to train to locally-adaptive K-A-B than generally-adaptive K-A-B. This is confirmed in discussions with others, notably Daro and Kysh. I have conducted several enquiries with this and found that, even though typically changes in knowledge and attitudes (K-A) are being assessed, it is certainly true that generally-adaptive behavior is more easily achieved through a well-thought-out curriculum or course of study.

Findings & Recommendations

- Begin the transition of existing professional development courses by dismantling the scope and content of the existing course of study and reconstituting the course around several clear and complete learning objectives.
- Configure the new on-line courses around a mix of instructional strategies that achieve the same learning objective.
- Test each new on-line course with a mix of on-line one-way content (Web pages) and interaction between and among course takers and/or teaching assistants through e-mail or threaded discussion groups.
- Make each new course reliable and effective before adding enhancements or adding new media. Test the way the course works before changing the way the course works. This includes enhanced forms of interaction like e-mail or list servers.
- As the value of additional forms of content delivery and interaction (streaming video, for example) are considered, introduce these as a test vehicle and assess their relative value to the learning process. The rule of thumb here is: test and make failure-proof the lowest technological levels first before adding more complex media or interaction.
- Employ a uniform standard for providing on-line content in text form.
- Provide graphic images directly proximal to the referring text. Do not make reference to a graphic that is accessed through a hyperlink.
- Structure the flow of the course in each of the learning objectives employing the fewest side-reference hyperlinks.
- Develop learning assessments that approach the extent to which the learner can exhibit critical new thinking in the area of the learning objectives.

Terms

Content: The substance of what the course transmits to the learner.

Curriculum: The subject(s) prescribed for study. See scope, content, and sequence.

Hypermedia: This involves the removal of a strict, linear, designer-driven sequence in order to allow for user-driven sequencing decisions.[1]

Instructional Design: A plan, purpose, or intent as it is manifest in a courses curriculum, syllabus, readings, interaction, and assessment forms.[2]

Interaction Forms: The ways in which the content provider (teacher or trainer and/or proctor or tutor) fields questions from the learners and either broadcast such queries and their responses to all or incorporate the query and response into the web-based instructional content. They can be characterized such as synchronous versus asynchronous, or one-to-one versus one-to-many. There is a wide range of different modes of interaction, including in-person localized proctors.

Scope: The range of the course of study. For example: Foundations of family counseling.

Sequence: The ordering of the content to achieve the instructional objectives.

Web Based Instruction (WBI), also called Web Based Training (WBT): The following definitions are not identical. The common theme is found in the use of the Internet and World Wide Web to deliver instructional content.

> Khan (1997) defines WBI as: "…a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported."
>
> Relan and Gillami (1997a) define WBI as: "…the application of a repertoire of cognitively oriented instructional strategies within a constructivist and collaborative learning environment, utilizing the attributes and resources of the World Wide Web."
>
> Clark (1996) defines WBT as: "Individualized instruction delivered over public or private computer networks and displayed by a Web browser. WBT is not downloaded CBT [Computer Based Training], but rather on-demand training stored in a server and accessed across a network. Web-based training can be updated very rapidly, and access to training controlled by the training provider."

[1] Kahn, 1997, p 341.

[2] Prior, Keith R. Presentation at the 1994 Distance Education Conference, Portland State University, Portland, OR.

Informants

Anonymous contributors to the Delphi Group. A total of seventeen professionals in distance learning/web based instruction participated in the Delphi Group on Web Based Instruction. The University of California, Davis protects the identities of this group through Human Subjects policies regarding voluntary participation, informed consent, and confidential record-keeping. All seventeen Delphi members work in instructional design in post-secondary education or in proprietary organizations engaged in on-going staff development through web-based instruction or tutorials.

The following individuals were interviewed between 1994 and the present as part of a general inquiry into instructional design, learning theory, and instructional practice with a special emphasis on research into distance education effectiveness and web based instruction.

Winifred Anderson, Consultant/Analyst III (Ret.), Teaching Resources Center, University of California, Davis.

Alfred Bork, Professor Emeritus, Computer Science, University of California, Irvine

Phil Daro, Former Director, New Standards Project, University of California, Berkeley; Executive Director for Policy Development, Office of the Provost & Senior Vice President—Academic Affairs; University of California, Office of the President.

Claire Daughtry, Manager, Instructional Television, College of Engineering, University of California, Davis.

Douglas James, Consultant, Distance & Extended Learning, Portland, Maine.

Judith Kysh, Assistant Professor, Mathematics and Education, San Francisco State University; Former Director of the California Mathematics Project.

Ralph Meuter, Director (Ret.), Distance Education, California State University, Chico

Anand Prasad, Dean of Instruction, Open University of Delhi

Uri Treisman, Professor, Mathematics, University of Texas, Austin; Director, Charles A. Dana Center and creator of AVID.

Dick Walters, Director, Office of Instructional Technology, University of California, Davis.

Resources

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Specifications

Constructivism

Concept: An approach to instruction that is based on the idea that all learners construct their understanding from their experiences.

Overview:

When novices encounter a problem, their attention is first directed to the acquisition of specific information that will be needed for algorithmic (locally adaptive) activity.

Using algorithms that have been supplied, novices achieve correct performance without relying on the simple understandings that result from the perception of essence (Remedial Processing).

When experts encounter a problem, their attention is first directed at the perception of essence (the generalizable context of behavior).

Conventional Instruction:

Concept: An approach to instruction that only permits algorithmic activity that is furnished to the learner and includes the remedial processing option.

Overview:

Topic of the day is introduced.

Examples are worked out by the instructor or provided in the text.

Rational for appropriate action (what is to be done) is presented.

Proper use of algorithms, rules, formulas, units, etc. is given and modeled.

The criteria for judging this instruction is based on how clear, well organized, and logical the presentation is and how easy it is for students to follow.

Constructivist Learning Theory

Concept: Focuses on the construction of understanding.

Overview:

Knowledge (understanding) is something that learners must construct for and by themselves.

Knowledge cannot be transmitted or given. Information can be.

The process of constructing one's knowledge leads to acquiring experience.

The Role of Prior Understanding:

Construction of new understanding involves relating new sensory input to prior understanding.

The meanings given to the new experiences depend on the prior understandings.

In the general notion of constructivism, the old understandings are modified, as well as the interpretations of the new experiences, as connections between the new and old understandings are made.

The Persistence of Prior Understanding:

All of us have been constructing understanding/knowledge since infancy.

This knowledge (intuitive theories, alternative frameworks, misconceptions, and personal conceptions) is strongly held and often very resistant to change.

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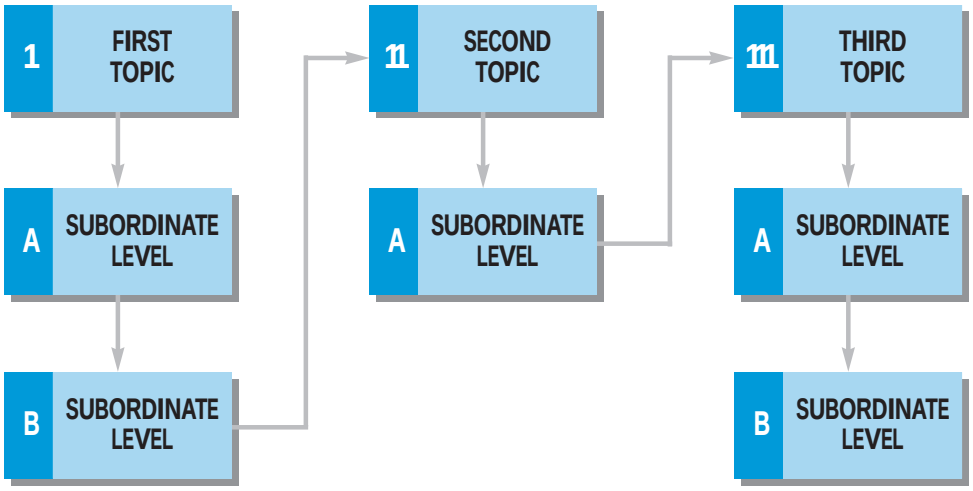
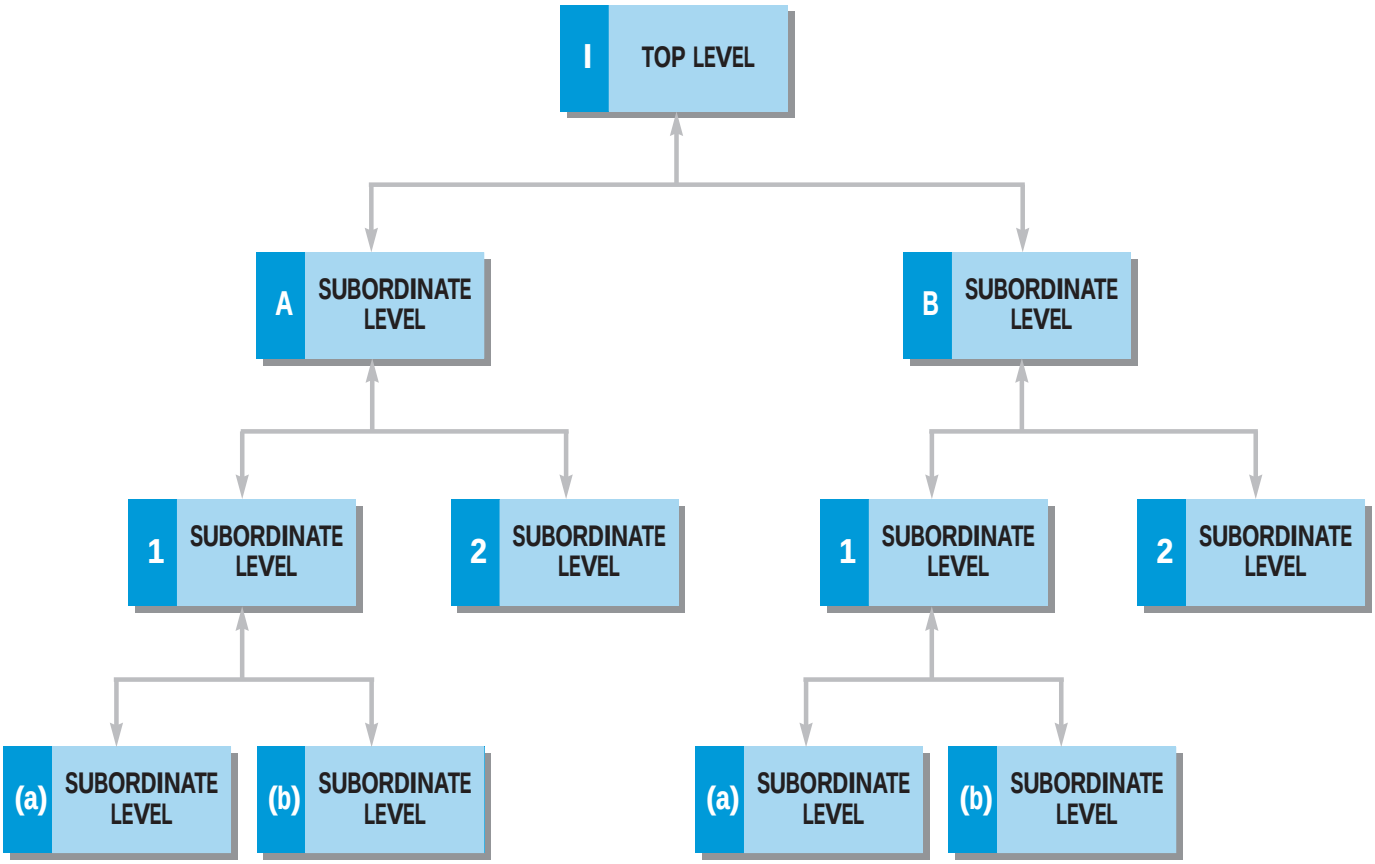
The Flow of a Conventional Course of Instruction



A Typical Gopher-Style Course Organization



Flow of a HyperText Course