A Conceptual Framework for the Design and Evaluation of Online Learning Modules in Professional Training and Academic Education in Business

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ABSTRACT

There is increasing interest in academic research concerning online learning. To date there is no unified theory of online learning. A developing theory of online learning posits that online learning is based on interactions between student and instructor, student and other students, and student and course content (Anderson, 2003). This theory suggests that learning takes place as long as one of the interactions is operative at a high level. This article seeks to contribute to online learning theory by presenting a conceptual framework that, 1) discusses online learning module design that integrates empirically sound learning theory research from the behaviorists, cognitive, and constructivist points of view and, 2) suggests a research agenda that might be used in the continuing development of a separate theory of online learning. There is much empirical evidence that suggests that student performance in online courses is not significantly different from performance using other delivery methods (Merrill and Galbraith, 2010). However, there is little research that has compared the effectiveness of online learning modules that have different characteristics. The proposed framework adopts the perspective that, meaningful development of an online theory of learning requires research that compares learning module configuration, instructional methodology, presentation enhancements (Cook, 2005), and interaction weighting, and application of key principles from previous empirical learning theory research. The framework should be beneficial to designers of online learning modules and online learning researchers who are interested in comparison of online learning module effectiveness.

INTRODUCTION

Over the last decade there has been a steady increase in online courses for professional training in business and online academic courses in all business disciplines. This is in spite of the continuing debate about whether or not online learning is as effective as classroom learning. There is substantial research that suggests that student performance in online courses is not significantly different from performance in traditional classroom courses. Arguably, some of this research is descriptive in nature with little empirically driven comparisons. However, there is an emerging line of research that controls for course and instructor differences and uses learning outcomes based performance measures (Merrill and Galbraith, 2010). The findings are similar to prior descriptive research. That is, student performance is similar in online and traditional classroom courses. There are still many additional research opportunities associated with comparing the learning outcomes of different instructional delivery methods, but, bottom-line, online courses are here to stay.

Nevertheless, academic researchers and online course designers are still faced with substantial challenges. Overcoming these challenges offers opportunity for the improvement of online education and the development of a unified theory of online learning. Experience has shown that time and effort spent in design and development of an online course can be extensive when compared to a classroom course.

In many cases, in both academic business and professional business settings, the instructor is tasked with a large portion of the learning module design and development. There may be some technical support available but we still have the long standing problem that there are few persons in academia or industry who are both skilled programmers and who are also knowledgeable in learning theories. The programming issue has been somewhat moderated by easier to use web design tools and learning module delivery software like WebCT, Blackboard, and E-College. However, the lack of knowledge of learning theory and how different aspects of learning theories might be applied to online learning is still widespread.

The purpose of this article is to present a conceptual framework that describes online course module design and development and that posits a new research agenda for online learning researchers. The process described takes into account Anderson's (2003) emerging theory of online learning that is based on different interactions that online students may experience. The proposed conceptual framework presented in this article outlines the decision process for the weighting of the interactions and also describes the application of key online course design options that are based on empirical research from behaviorism, cognitive, and constructivism learning and instructional theories. Finally, the framework delineates potential online research agenda items and variables. The research agenda is based on the CBL-CBL comparison paradigm of Cook (2005).

The remainder of the article is organized as follows. First, Anderson's (2003) theory is briefly discussed and the overall framework is presented. Next, the decision process of weighting the interaction within an online learning module and the application of principles from empirical research on learning theories is discussed. Then a research agenda that calls for research that focuses on comparison of online learning modules instead of differences in delivery methods is described. The article concludes with final thoughts and recommendations.

The Framework

In this article I am narrowly defining an online learning module as a learning module that is presented on a course website. The term 'online learning' is used in this context. The learning module may be delivered by software such as Blackboard or it may be presented on a website by programming without predesigned delivery software. The module is a self-standing lesson that is part of a business training program or academic business course. It could be one of many modules or a single module for a specific purpose (i.e. ethics continuing professional education training, etc.).

The conceptual framework described in this article is based on my perception of reality as an online educator. A primary interest is designing, developing, and delivering quality learning modules that result in high student achievement and meaningful learning outcomes. A unified theory of online learning would be a beneficial aid in the design and development process of these learning modules. Such a theory would also lead to increasing empirical research opportunities concerning online learning. I encourage researchers and academia in general to make the development of such a theory a priority.

The conceptual framework discussed in this paper is based in part on Anderson's parsimonious equivalency theory of educational interaction, (hereafter student interaction(s)), related to online learning:

> "Deep and meaningful formal learning is supported as long as one of the three forms of interaction (student-teacher; student-student; student-content) is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience. High levels of more than one of these three modes will likely provide a more satisfying educational experience, though these experiences may not be as cost or time effective as less interactive learning sequences. " (Anderson, 2003)

An overview of the framework is presented in Figure 1. The three types of student interaction are at the center of the framework. In addition, I have added a student-software interface interaction using the flowchart symbol for predefined process. I am assuming that most online instructors and designers will be using some kind of course development software as opposed to raw programming. The three student interactions specified by Anderson are somewhat fluid and overlapping once the learning module is started. Whereas, the software interface is often limited to the form that came off the shelf, thus somewhat fixed in nature. Similarly, once established at the beginning of the lesson and communicated to the students, the assessment parameters are usually somewhat fixed.

The preparatory step in learning module design must necessarily start with an understanding of the learning objectives for the lesson or module. This helps to focus the design process and determine assessment characteristics. The next step in the design process requires several decisions related to the weight to be given to the student interactions, the inclusion of empirically tested best practices from learning and instructional theories, and a decision that determines the assessment parameters and methodologies. Together these decisions will establish the overall learning strategy for the module. Early in the design process the assessment determination needs to be carefully considered for two important reasons: 1) once the learning module is started and the assessment parameters have been communicated to the students it is technically possible to change the assessment methodology, however, doing so may disrupt the learning process, and 2) the assessment variables chosen will likely form the basis for dependent variables in future research. Typical assessments will come from performance on quizzes, exams, and research papers. Learning outcome measures, student feedback, and other methods may also be used.

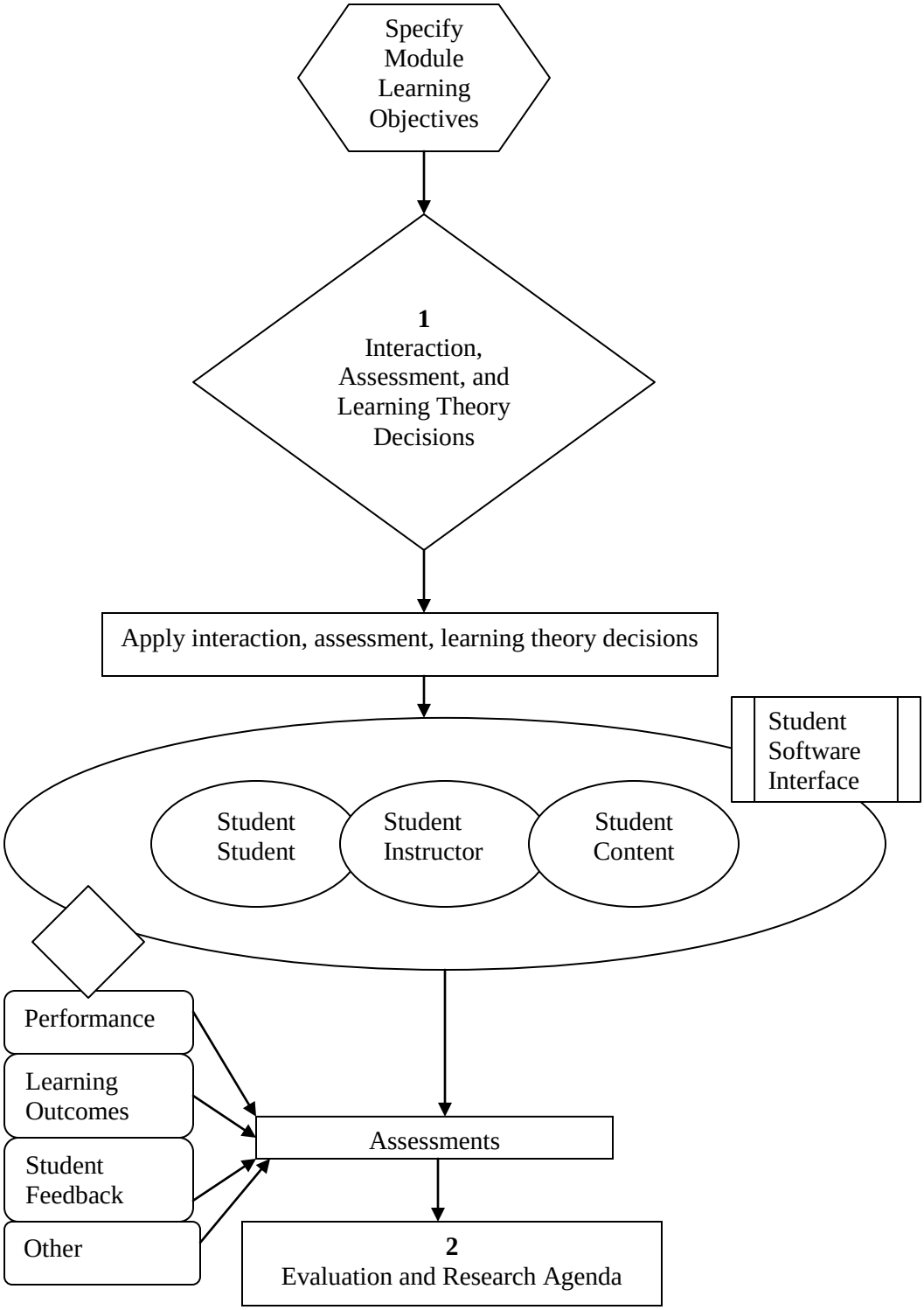

Figure 1
Conceptual Framework for Learning Module Design and Research in Online Learning

When incorporated into the learning module, the student interaction parameters, the assessment plan, and the application of key principles from learning theory will determine how the instructional strategy will be implemented. This instructional strategy will have the greatest affect on the student's learning experience and learning outcomes, not the technology (Ally, 2008). However, the software interface does have some impact on the learning experience. Chalmers (2000) found that students preferred to have a table of contents or chapter outline, wanted to be able to highlight and print subject matter, and wanted a glossary for major terms. Most of the current off the shelf course development software now allows the instructor/designer to incorporate these features into a learning module. The next section of the paper presents a more detailed discussion of the decision process considerations related to the establishment of the overall instructional strategy.

Interaction, Assessment, and Learning Theory Decisions

Recall that under Anderson's equivalency theory (2003) the conduct of a course or learning module revolves around student interactions with the instructor, other students, and the course content. Student interactions can be dynamic at a high or low level during the conduct of the learning module. This will be largely determined by the interaction balance decisions that are made by the instructor/designer during the initial design process. The important student interaction weighting decision is influenced by several factors including instructor and learning module considerations, learning theory considerations, and assessment parameters. These factors are displayed in Figure 2. The decision process is likely to be circular and iterative as depicted by the circular arrows in Figure 2.

The student interaction weighting decision is a matter of compromise and balance. First, the learning module management factors of educational content, learning objectives, convenience of both the instructor and student, available time of the instructor and students, and cost must be carefully considered. We can't be all things to all folks, so practical online learning module design becomes a matter of well thought out trade-offs. An overriding consideration is the available features of the software to be used. If the software has shortcomings in one of the student interaction parameters this will certainly influence the weighting decision. A perennial problem to avoid is that of the online instructor potentially being on-call 24/7. On the other side, a learning module can be over designed so that the student workload demand is unreasonable.

An online learning module can also be too assessment intensive. The assessment parameters are closely allied with the module management factors in terms of student interaction possibilities and should be carefully considered. Kim, et al. (2008) examined the assessment schemes of three different online programs at a large University. One program was the continuing studies undergraduate program, one was an online MBA program, and one was the distance education program from the School of Education. They categorized the assessment schemes into seven categories:

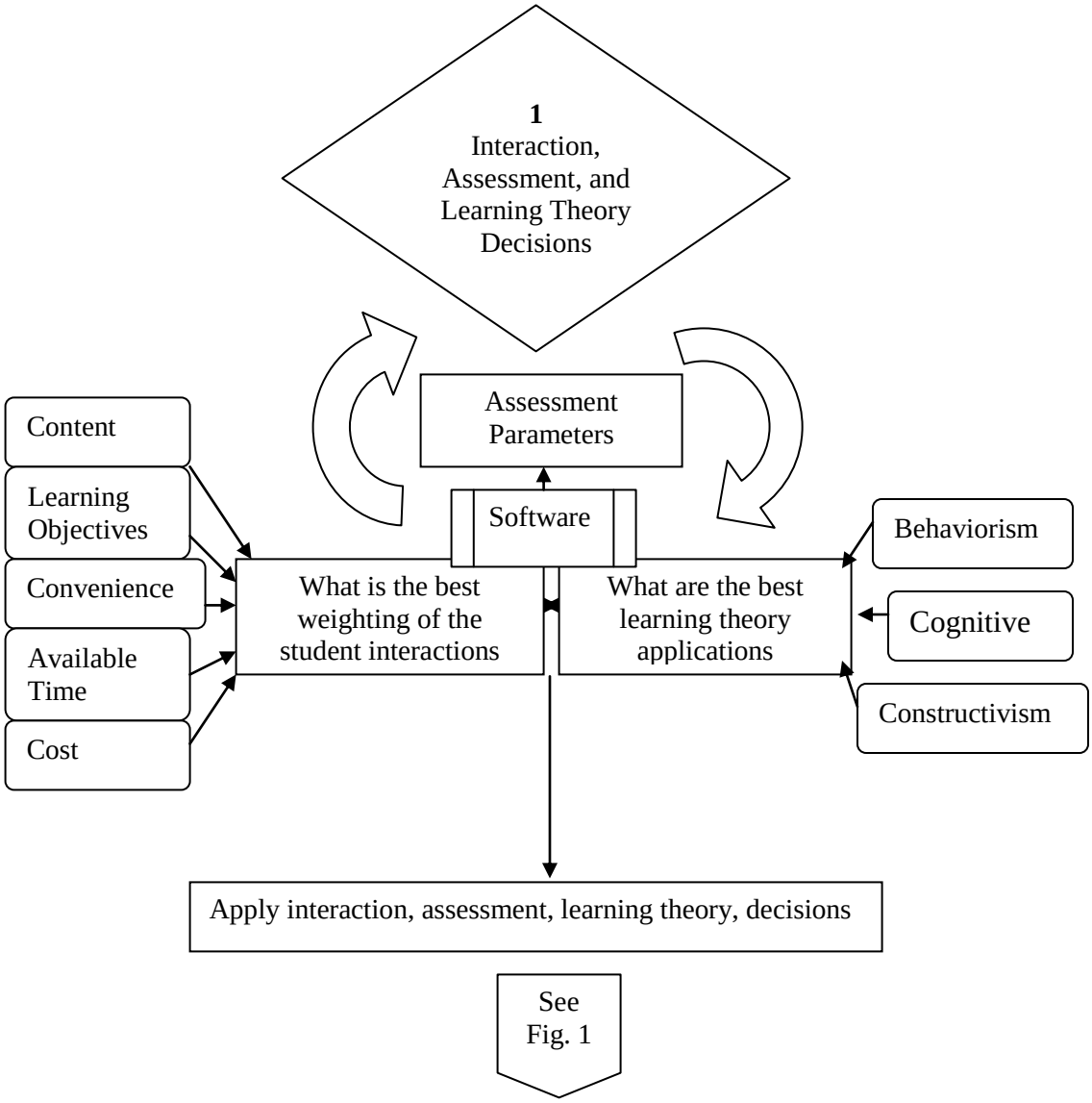

Figure 2
Expansion of the Interaction Weighting, Assessment, and Learning Theory Application Decision process

- Paper/Essay...
- Exam/Quiz/Problem Set....
- Discussion/Chat...
- Project/Simulation/Case Study...
- Reflection ... (lessons learned, etc.)...
- Portfolio (collection of individual production)...
- Peer evaluations...

The most frequently used assessments were exams, quizzes, and problem sets followed closely by papers and essays. Further analyses showed that the assessments were both formative (feedback soon after the assessment) and summative (end of the learning process). On average, formative held a slight edge. Associated with the overall assessment scheme decision is the issue of proctored or unproctored exams. Rovai (2000) suggests that proctoring can be accomplished by telephone, chat room, email, or exams at proctored testing centers.

A decision issue related to interaction weighting and assessment is how to best apply proven instructional methods from general learning theories to online learning modules. Different schools of learning theory may have a somewhat fanatical following and at times it may seem that they are in conflict. It is beyond the scope of this article to discuss this seeming disparity. Rather, my intent is to briefly discuss several empirically proven applications from the different schools of learning theory that may be easily implemented into an online learning module. We start with a brief overview of the three major schools of learning theory.

Behaviorism learning theory stems for experiments on pigeons and rats conducted by Skinner and associates (Skinner, 1986). The original experiments took place in the early 1950's. The theory of operant conditioning grew out these experiments. The behaviorist school of learning is interested in the measurement of observable learning results based on stimuli and reinforcement during the learning process. This school is not interested in the mental processes that take place during the learning experience just the observable results.

Cognitive learning theory (the most popular) is interested in the mental processes that take place during learning. This theory hypothesizes that a learner develops mental models (templates and schemas) during the learning process. These schemas or templates can be retrieved from memory (in some cases automatically) and applied to similar problem situations. Memory is an important part of cognitive learning theory from a retrieval standpoint and from a speed of learning new material standpoint. Complexity theory is an extension of basic cognitive theory. Complexity theory is interested in studying cognitive interaction complexities whereas pure cognitive learning theory takes a more linear approach to cognition. Interestingly, the information processing model of cognition developed from the cognitive school of learning (Simon, 1996). This led to development of an *objectivism* tradition that combines element of cognitive learning theory and behaviorism.

Constructivism is the latest learning theory. It also developed from the information processing model of cognition. Some would argue that rather than a theory this is a philosophical viewpoint. The perspective is that knowledge is developed by the learner as opposed to the interpretative view that knowledge exists and it is the instructor's task to help students find it. The constructivist view sees the instructor as a facilitator helping the learner construct knowledge.

Each learning theory has a lot to offer the online learning module instructor/designer but there are certain selected empirically sound principles that I believe may prove helpful. From *behaviorism* (Skinner, 1986) we have several principles that can be readily incorporated into an online learning module. Immediate reinforcement: this can be accomplished by enabling immediate feedback for online assessments. Punishment is ineffective: difficult material that results in a large number of initial incorrect answers is frustrating to students. Difficult material may best be addressed by assessment means other that multiple choice questions. Shaping: when complex material is presented it should move from simple subject matter to more complex subject matter, in small steps. Motivation and attention: when important material is presented it must require careful reading and attention otherwise students may have attention gaps in the learning sequence. Active participation: there must be a way for the instructor to determine when a student is having trouble with the material. From Kritch and Bostow, (1998): frequent overt constructed responding opportunities within instructional contingencies during tutorials overcome the boredom factor.

As previously mentioned sometimes *cognitive* learning concepts have been combined with behaviorism. An example of this is the differential outcomes procedure (Mok, et al. (2010). This procedure works well with material where the student is required to discriminate between two similar items. The assessments or tutorials can be designed so that a unique outcome comes up for each correct choice of relationship. For example, outcome for a correct choice of relation 1 could be a video clip. Outcome for correctly identifying relationship 2 could be a music clip. This procedure is useful when high-level cognitive processes are involved in the learning process.
Darabi, et al. (2009) found that students did better on a complex learning task when supporting information was supplied along with problem solving practice and testing. Significant change in the mental models of students with supporting information was noted when compared to students who did not receive supporting information during the lesson. Sinclair, et al. (2004) found that better higher order learning took place when students were required to master and work basic problems before the higher learning skills were introduced.

For *constructivist* the ideal learning environment would be one that is based around an open learning system that uses social networking technologies and that is that is learner-centered, knowledge-centered, community-centered, assessment-centered, with widespread media and technology availability (Lee and Lin, 2009). The role of the instructor may be slightly different than the traditional view in this type of system. There is increasing interest in constructivism in the context of emerging online technologies and the semantic web. As online instructors/designers we can certainly incorporate some of the concepts in our courses. Knowing who our learners are and their backgrounds and learning styles will help us be more learner-centered. A module could be designed to collect basic learning style and personality information early in the learning process and then modified later. Letting students construct their own knowledge base (situated learning) emphasizes a knowledge-centered environment. High interaction with other students may create a community-centered environment. Using assessment tools such as portfolios and team projects and being careful to provide timely feedback on exams and projects represents an assessment-centered environment. The constructivist approach will be a subject of much discussion as the world-wide web continues to develop. Experience tells me that this approach will require much more instructor time and commitment than we in academia typically have available. This is an emerging issue that educational administrators and educational leaders involved in online learning will have to deal with at some point.

There are many other research studies that have application to online learning module design. The intent of article is not to provide a comprehensive listing of those research studies, although this would seem to be a beneficial research endeavor. Some of the major issues related to online design decisions involving student interactions, assessment, and learning theory applications have been presented. The next section discusses a new research agenda for online learning.

A Research Agenda for Online Learning

Online learning is a phenomenon that is becoming more firmly entrenched in formal and informal educational circles worldwide. Perhaps it will never fully replace traditional classroom learning in an academic or professional training setting but it is certainly becoming more commonplace at all levels of academic education and professional training. As the world-wide web continues to develop online learning will have an increasing presence in the future. Merrill and Galbraith (2010) point out that there is still much more research necessary to more fully understand the learning outcomes of different delivery methods. I agree with them but I also agree with Cook (2005) and Freidman (1994) who call for research directly focused on within computer based learning differences instead of delivery based differences. In my version of this idea, we need research that focuses on online learning module differences. An overview of this concept is show in Figure 3.

Much could be learned from more fully understanding how the online learning module tools used (configuration), the instructional methodology, the presentation enhancements, the student interactions, and learning applications from different schools of learning theory impact student performance, learning outcomes, and student satisfaction. The conceptual framework presented above and the discussion of module design decisions naturally leads to variables that can be used to evaluate and compare online learning modules for instructional improvement purposes. The framework also provides the opportunity to empirically test these factors for formal research purposes. This type of research along with online learning research that examines learning outcomes based on cognitive and behaviorist approaches compared to the constructivist approach will be important if we are to derive and develop a cohesive theory of online learning.

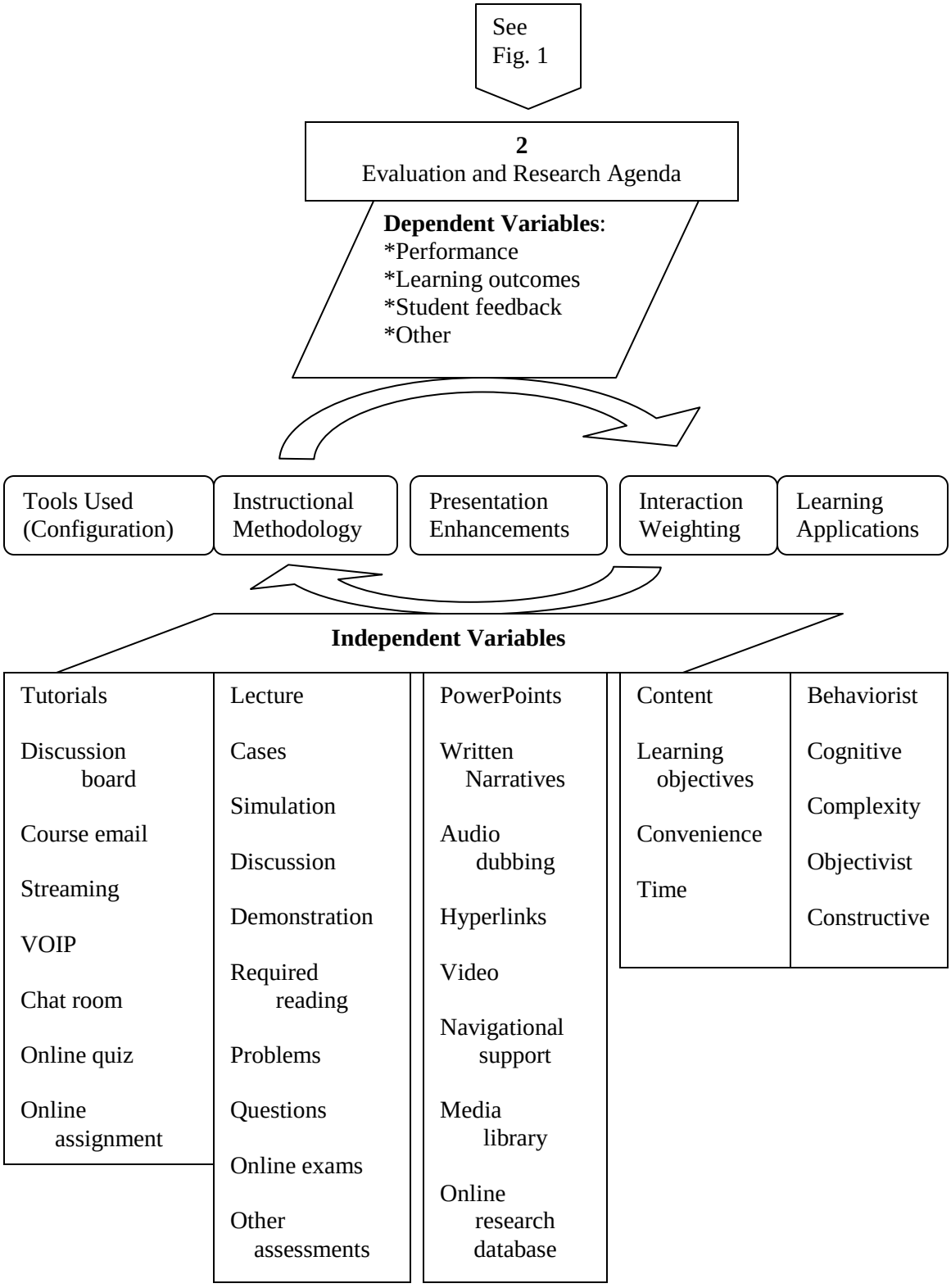

Figure 3
Expansion of the Evaluation and Research Agenda

Conclusion

This article has presented a conceptual framework that can be used by online learning module designers and instructors in the design process. The framework focuses the learning module design around the three student interactions (student-student, student-instructor, student-content). Design decisions involving the student interactions, assessment considerations, and possible learning theory applications were discussed. Use of the framework in the online learning module design leads to development of dependent and independent research variables that can be used to evaluate the effectiveness of different learning module characteristics.

The issue of learning outcomes with online learning versus traditional classroom instructor and other delivery methods continues and there is much research that still needs to be done when comparing different delivery methods. But the debate about whether online learning should be an essential part of professional training in business and formal academic business education should be over (it isn't, but it should be). Absent some world catastrophe, the momentum for online education caused by the increase in technology and the world-wide web won't be slowed down. What we need now is research that achieves empirically sound within comparisons of online learning modules and online courses. Such research will help us develop a better online education product and help us derive a learning theory that is unique to online education.

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