INTRODUCTION

Since the emergence of the Internet and the Web as a means of providing instruction and the fast expansion of interest in these media in the mid 1990’s, there have been a number of studies which investigated their technical features, and tried to connect these features to the problems of designing WBI. Those studies suffer from a common shortcoming.

There is little linkage to established pedagogical theory in general or to distance education theory in particular. The questions they raise have little relationship to what is already known about learning and teaching at a distance, albeit that what is known has been developed over many years of research and experience with different communications technologies. Furthermore, no attempt has been made to develop a theoretical or a conceptual framework of WBI in order to understand its pedagogical feature in a logical way. There is a research need to make sense of pedagogical features of WBI in the context of distance education theory and to contribute to a revision of such theory to accommodate the new teaching experiences of WBI.
This paper attempts to analyze teaching and learning processes of WBI as shown in recent literature using a prominent existing distance education theory called Transactional Distance Theory in order to provide knowledge basis for developing a theoretical framework of WBI and to contribute to the improvement of teaching and learning in WBI.

This paper will review a selection of recent literature on teaching-learning processes in WBI or similar network-based instruction to identify the major pedagogical features of WBI using the conceptual framework of the transactional distance theory. The literature review of WBI or network-based instruction focuses on papers published in six major journals of distance education and educational technology between 1997 and 1999. Those journals were selected from twenty most cited journals in the (International Council for Distance Education) citation index. Both theoretical discussion papers and reports of empirical studies are included in the review (Bunker, 1998). Through these processes, some new concepts that may help explain the pedagogy of WBI, which may not have been captured in the transactional distance theory will be proposed. The study concludes with suggestions for future research.

CONCEPTUAL FRAMEWORK FOR THE STUDY

Transactional Distance Theory
Transactional distance theory describes pedagogical relationships existing in a distance education environment i.e. one ‘that has the special characteristic of separation of one from another, and a consequent set of special teaching and learning behaviors’ (Moore, 1991, 2). According to the theory, there are three key constituent elements that define every distance education program: dialogue, structure, and learner autonomy. Dialogue refers to the extent to which teachers and learners can interact with each other and structure refers to the “responsiveness” of an educational program to an individual learner’s needs (Moore, 1993). Learner autonomy is the extent to which learners make “decisions regarding their own learning” and “construct their own knowledge based on their own experience” (Moore & Kearsley, 1996, 204-205).
Seven studies that examined the conceptual elements within the theory of transactional distance were located for review in the paper. Six papers reported empirical testing of the concepts of the transactional distance theory and one paper -- by Saba (1988) -- proposed a model to measure transactional distance in instructional settings. Among the six empirical papers, two papers dealt with the same issue in different formats: one as a dissertation and another as a journal article.

The review of empirical studies indicates that the transactional distance theory provides a useful conceptual framework for defining and understanding distance education in general and as a source of research hypothesis more specifically. Most of the studies confirmed Moore’s original proposal that transactional distance decreases when dialogue increases and structure decreases, and when structure increases transactional distance also increases, but dialogue decreases. However, some research such as Chen and Willits (1999) and Saba and Shear (1996) suggest several advances beyond the original concept, particularly the possibility of articulating the constituent concepts - structure, dialogue and learner autonomy – and of expanding the concepts to take into account more specific characteristics of teaching and learning environments including the technology employed in those environments.

In the following sections, this paper will suggest some key features of WBI which have been identified in previous studies, organize those features using the conceptual framework of the transactional distance theory, and articulate or expand the three constituent concepts of the transactional distance theory in light of this new, emerging data.

**PEDAGOGICAL FEATURES OF WBI FOUND IN RECENT LITERATURE**

**General findings**
The 58 articles reviewed in this study showed a variety of research methodologies and research themes (See Table 1). Fifteen of them (26%) adopted quantitative or qualitative experiments or quasi experiments as their research methodology, eighteen
articles (31%) were developmental studies in which design and development strategies of WBI or other network-based education were reported, thirteen (22%) were evaluation studies in which specific WBI or similar types of online courses were evaluated in a rather structured way, and the remaining twelve papers (21%) discussed ideas and positions regarding WBI or network-based instruction. Out of 58 papers, thirty articles (52%) discussed WBI in particular, thirteen papers (22%) reported the use of computer conferencing in network-based learning environments, and the remaining fifteen papers (26%) discussed WBI along with other technologies.

Unfortunately, not many studies investigated pedagogical processes in WBI in a rigorous manner. That is, what was really happening in teaching and learning processes of WBI and why it happened were seldom the focus of the studies. Rather how to design effective WBI, how to encourage interaction, and what were the effects of WBI on learner satisfaction and perceived learning outcomes were the most frequently asked research questions.

Overall, research on WBI has indicated ‘student-centered learning environment’, ‘full of multimedia resources’, ‘expanded interactivity’, and ‘adaptability to different student characteristics’ as distinctive features of WBI, most of which reflect integration of technological features of Web into WBI. Virtually all researchers come to WBI research with little background in distance education, so that there is little research that compares these characteristics of distance education in the Web environment and their manifestations in programs delivered by previous technologies.

**Structural features in WBI as a teaching variable**

The structure of a distance education program is representative of its teaching elements. There are relatively few journal articles that research the structural aspects of WBI as compared to those on dialogue or the interaction aspects of WBI. There are no existing articles that empirically examine the rigidity or flexibility of WBI structure as compared to more traditional distance education courses. However, there is a high level of agreements across the various studies that WBI can provide a flexible teaching and learning environment because of some of the technical features of the Web.

In general, previous studies of WBI showed that WBI provided a flexible and adaptable content structure using hyperlink technology. The key elements of this structure are (1) content expandability, (2) content adaptability, and (3) visual layout, because the structu
Dialogue in WBI as a communication variable
Moore defines “dialogue” as the extent to which the learner and instructor interact with each other. In WBI, several different types of interaction besides interaction between the learner and instructor have been observed.

By looking at studies that have examined the communication aspects of WBI, we can conclude that WBI contributes to increasing student’s involvement in teaching and learning processes by allowing for various types of interaction. Three emerging types of interaction, or three aspects of dialogue, have been identified through the studies. Those studies were: (1) academic interaction between learners and instructors, including external experts; (2) collaborative interaction among learners; and (3) interpersonal interaction between learners and instructors, or among learners.

Learner autonomy as a learning variable
Distance programs can be classified in terms of what degree of learning autonomy learners have. WBI seems to provide individualized learning environments that allow learners to exercise autonomy in their learning.

In addition to autonomous learning, another aspect of WBI that has appeared in the literature is collaborative learning. Learners in WBI learn collaboratively as well as individually.

The analysis of WBI studies leads us to a tentative conclusion that taking part in a WBI course requires that learners be collaborative as well as autonomous. Both learner collaboration (or learner collaborativity, if we create a new term) and learner autonomy seem to have emerged in Web-based learning environments. Of course, WBI can differ in the degree to which it accommodates these two elements.

SUMMARY AND CONCLUSIONS

This study attempted to investigate the pedagogical features of WBI that can be found in previous studies by using the conceptual framework of transactional distance theory. Even though this framework appeared to be applicable for understanding the pedagogic
al features of WBI, several new concepts that have not been captured by the transactional distance theory were proposed. Figure 1 summarizes the pedagogical features of WBI found in recent studies.

As indicated above, previous WBI research shows little resemblance to established pedagogical theory in general or to distance education theory in particular. We need WBI studies that discuss what is already known about learning and teaching at a distance and that examine student experiences with different communications technologies.

This analysis of recent literature on WBI used the conceptual framework of the transactional distance theory and raises a number of questions that can guide future research. There is a need for an empirically supportive foundation before answering these questions is possible. Most of the research reviewed in this paper had methodological shortcomings. In order to enhance teaching and learning in WBI, we need conclusive findings, which requires research that adopts a more rigorous methodology.

**Figure 1: Pedagogical Features of WBI**

**Communication variable**
- Academic interaction
- Collaborative interaction
- Interpersonal interaction

**Learning Variable**
- Learner Autonomy
- Learner Collaboration

**Teaching variable**
- Content expandability
- Content adaptability
- Visual layout

**Transactional Distance in WBI**