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FIRST CONTACT:
THE USE OF SCHEMAS BY STUDENTS TAKING THEIR FIRST ONLINE COURSE

By

Ann Marie Paulukonis

A DISSERTATION

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ABSTRACT

FIRST CONTACT:
THE USE OF SCHEMAS BY STUDENTS TAKING THEIR FIRST ONLINE COURSE

By

Ann Marie Paulukonis

Online education is a burgeoning field with an ever-increasing number of courses being offered from Internet basics to master's degrees in Criminal Justice. Nevertheless, little is known about how students learn in online environments. To develop appropriate interfaces, developers of online courses must be aware of students' conceptions about both the new environment and other learning environments. Questions must be asked about how easily people move between learning environments and to what extent they grasp the new one.

To shed some light on this, schema theory and Cognitive Flexibility Theory (CFT) are used to examine how students understand their first online course. These theories help explain how people make sense of the world through their experiences and how they use that structured knowledge to interact with the world. The foundations of schema theory in reading comprehension and other fields are discussed, followed by a discussion of CFT. I then show how to use them to understand interactions with computer software.

The instructor, developer, and five students of one online course were interviewed. The course was developed and offered through Michigan State University's (MSU) Virtual University. The students discussed their expectations of the course, their actual experiences, and problems and solutions they had with the new environment.

The students brought a wide variety of schemas to the new environment. The schemas fit into three main categories: classroom experiences, other learning experiences, and technology experiences. Including a number of affective issues, 17 schemas were found among the five students. These included schemas based on experiences with classroom discussions, interactions with classmates, distance education courses, email, and more. These already-developed schemas both helped and hindered the students as they attempted to understand and develop schemas for the online course. I discuss each previous experience and the related course experience, and how the two clashed or corresponded.

Recommendations for further research and for online course development are given. I also indicate present work at MSU's Virtual University to address some of the issues.

I dedicate this...

to my parents, Mary Ann and Jay Paulukonis, who encouraged me to stick it out through my first year of graduate school.

to my fiancé, Eric J. Johnson, without whom I would not have made it through my last year.

and to my brother Michael, who reminds me that we all have different arts.

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Chapter 1: Introduction and Background

Online learning is a newly burgeoning field. Courses are offered in everything from how to use the Internet to master's degrees in Criminal Justice. In 1997, *The Oryx Guide* (Burgess) listed 29 institutions offering Internet programs of study leading to certificates or advanced degrees. *College Online* (Duffy, 1997) listed 83 degree or certificate programs at 17 colleges, institutes, or universities. These numbers are steadily increasing and do not include institutions offering individual online courses within regular programs of study.

As with any new medium for teaching and learning, successful developers and instructors of online courses will pay attention to how students experience these courses. Instructors need to be aware of what students are bringing to the learning environment in order to create curriculum materials. To develop appropriate interfaces, designers and developers need to be aware of teachers' and students' conceptions about the new learning environment as well as other learning environments. Questions must be asked about how easily people move among their different learning environments and to what extent they grasp new ones. Little is known about what and how students are learning in online environments. Some of the issues to be addressed include: How do students new to online education learn how to use the online materials? How do they learn how to learn with the site? How do they make sense of the situation initially? What the internal picture does the user have of the course, how to use it, and how to learn with it?

Schema theory provides a conceptual tool to help examine these issues. Schema theory is a way of explaining how people structure their knowledge of the world

(Rumelhart, 1980; Pearson, 1982; Anderson, 1984a). It tells us how people make sense of the world through their experiences, and use the resulting structured knowledge to interact with the world. Schemas are general, abstract cognitive structures created over time in our minds as ways to organize the world. They give us general plans for how things should be, including connections among people, actions, objects, and abstract concepts (Pearson, 1982).

Schema theory's heyday was the early to mid-80s. Interest in schema theory seems to have faded as social views of learning have come to the forefront. Schema theory, however, provides an explanation for how knowledge of the world—as cognitive structures within the individual—shape and constrain the individual's interactions with the world. That is, it could provide a bridge between representational and social views of learning. In the last decade, a second-generation schema theory has been developed called Cognitive Flexibility Theory. This theory shows that people apply not just one schema but parts of multiple schemas to understand new situations (Spiro, Feltovich, Jacobson, & Coulson, 1992).

In this research, I use schema theory and Cognitive Flexibility Theory as conceptual lenses for understanding how students come to understand how to use and learn from an online masters-level course. First, I explain how this study provides a theoretical perspective that the distance education literature has not offered. Then, before describing the details of the study, I provide an overview of schema theory and consider how it can help us understand learning in electronic environments, including educational software

and online instructional settings. In the study, I use this theory to shed light on how students understand online courses—an issue that urgently needs focus and guidance.

Distance Education

Distance education has been around nearly since the beginning of the mail system. Over the last century, it has moved from print-based correspondence courses to broadcasting via the mass media of television of radio. It moved into personal media of audio- and videotapes and most recently into telecommunication systems of the Internet, video conferencing, and fax machines (Schreiber, 1998; Daniel, 1996; Verduin & Clark, 1991; and others). Distance education, in its simplest definition, means education where the student and the instructor are separated in place, and often, also in time. What was once fairly uncommon is becoming much more commonplace, experiencing particularly rapid growth in the last two decades (McIsaac & Funawardena, 1996).

However, little theoretical attention has been paid to these learning environments (McIssac & Funawardena, 1996). Many reports simply describe existing distance education programs (e.g., Connick, 1994; Roberts, Blakeslee, Brown, & Lenk, 1990; and Schreiber & Berge, 1998). Other studies have focused on comparisons among types of distance education or between distance and face-to-face classrooms. Other discussions of distance education and of online education have been just trying to describe what it is. For example, writers from 1989 (Harasim) through 1997 (Porter) produced chapters or entire books attempting to describe what online education is. None of these are very useful for guiding practice and curriculum or interface development.

McIsaac and Funawardena (1996) noted that "distance education" as a field has tended to be a hodge-podge of ideas and theories. Developers have typically not used theoretical frameworks but instead simply attempted to transfer a face-to-face course to a distance education course. McIsaac and Funawardena called for work on finding theoretical frameworks to help guide design of distance education. They also suggested further research that focuses on how the learner uses the technology to come to "generate knowledge."

One attempt to do so has been the call for "user-centered design." McKnight, Dillon and Richardson (1996), Verduin and Clark (1991), Duning, Van Kekerix, and Zaborowski (1993), Mason and Goodenough (1981), Harrison (1999), and Kaye (1981) all call for the use of user-centered design in the development of educational technologies (although only McKnight, Dillon & Richardson used this term). However, none of these authors explain this type of design framework in much detail nor why it is important.

Writing to course developers, Mason and Goodenough (1981) reminded them to "Keep the Student in Mind" (p. 115). By this, however, they were not speaking of experiences the student might bring, but only the student's rate of mastery (need for multiple passes at the information), that their confidence in the subject matter will grow, and to divide the material into appropriately sized chunks.

Verduin and Clark (1991) also pointed out that learners come with different past experiences, expectations, needs, and so forth. While they recommended considering these individual differences when planning the distance education course, they, too, do not provide much methodology for determining these. They do recommend a student

self-assessment of learning style or a small survey of prior content knowledge at the beginning of the course. Neither of these are of great use to a designer during the development phase, unless used for subsequent courses.

Duning, Van Kekerix, and Zaborowski (1993) also said that one guiding assumption for distance education is to focus on the student: "The future lies with the learner" (p. 30). Like others, the authors did not provide any guidance to the designer in doing this. Instead, they focused on organization-level issues, such as a plan for implementing a distance education program, staffing concerns, and marketing strategies. Chute, Thompson, and Hancock (1999), Verduin and Clarn (1991), and Daniel (1996) also focused more on the institutional concerns than on how designers can understand their learners.

Chute, Thompson, and Hancock (1999) did recommend a user needs assessment, albeit with a very brief discussion. They pointed out that the learning requirements as well as motivations of the students are very important before designing a delivery system and courses. Kaye (1981) also recommended—in a lengthier description—finding out "Who are the students?" (p. 32). He recommended researching demographic statistics, whether student groups will be presently served or new to the institution, lifestyle data (such as amount of study time available), infrastructure availability, and background education or training. In all the books surveyed, this was the only one with a whole chapter devoted to finding out who students will be. Others, while professing to encourage user-centered design, did not attempt to actually explain it to the reader.

Harrison (1999), who wrote directly for new distance education teachers, suggested it is important to know the user. With no reference to theory or saying why it is important, he suggested a few questions to ask the users. He also suggested designers could ask the questions of themselves about their users without ever actually speaking with the users themselves.

Researchers and writers in the distance education field have not provided a theoretical lens to help developers of online courses. Therefore, we must look outside this field for help. In the rest of this chapter, I explain how the concepts of schema theory and Cognitive Flexibility Theory can help designers figure out how to design in a user-centered way.

Schemas in Text Comprehension

Imagine someone picks up a dictionary to read. This person has never used a dictionary before but has read numerous novels. She assumes this is just another novel and attempts to read it in the same way. She starts on page one and reads every line in sequence, just like she would a novel. We readily would say this person does not understand how to use a dictionary appropriately. (Not to mention that she will probably set the book down after reading at most a few pages!) However, people typically learn either in school or through out-of-school reading experiences about the differences among dictionaries, romance novels, encyclopedias, fairy tales, textbooks, and science fiction books. We would expect students who have read many of one type of book to be able to read more texts of that type and to understand their structure. This is called having

a schema for that type of text (Mandler, 1984). A person's schema delineates the overall structure of the text or of the text's content.

How does a schema help us when we read? According to Anderson (1984a), there are, tentatively, six main functions of schemas in reading. A schema "provides ideational scaffolding for assimilating text information, facilitates selective allocation of attention, enables inferential elaboration, allows orderly searches of memory, facilitates editing and summarizing, and permits inferential reconstruction" (p. 248). A schema helps a person understand the text's content, attend to specific pieces of information, fill in missing information, and later recall the text. That is, the schema enables the reader to comprehend what she read. "Comprehension is a matter of activating or constructing a schema that provides a coherent explanation of object and events mentioned in a discourse.... The click of comprehension occurs only when the reader evolves a schema that explains the whole message" (Anderson, 1984a, p. 247).

Theorists have described a number of different types of schemas. Pearson (1982) wrote that there are a wide variety of schemas, including schemas for simple objects (desk, car, dog), abstract entities (hope, peace, love), actions (eat, sell, jump), complex events (going to a restaurant, attending class), and very complex entities (novel, computer game, world affairs).

Anderson (1984a, b) classified schemas into two types, *content* and *structure*. Content schemas help one understand readings about specific events. For instance, one might have a schema about ship christenings, washing clothes, or geometry. People who already have a schema for the event being read about have better comprehension of the reading

than do those unfamiliar with the event (Anderson, 1984b). These content schemas are helpful both in and out of reading. They help when participating in or observing events as well when reading about them.

Structure schemas guide one in reading specific types of text such as a short story, a textbook, or a research article. They lay out what is called a *story grammar*, or expectations within the text. For instance, when reading a classic fairy tale, one expects (perhaps) a princess in need of rescue. The prince who falls in love with her (at first sight, of course) must pass through a number of tests to free her from the danger. At then end, the two live happily ever after. When we (or, particularly, a young child) read a fairy tale that conforms to this schema, we are more likely to understand it than when reading a story whose pieces do not fit as well (Anderson, 1984a, 1984b). It would seem that these structures are also readily apparent in reading different texts such as dictionaries, novels, and scholarly journal articles (Mandler, 1984). Each type of text structure requires a different schema in order for the reader to best understand the text and how to read it.

Schemas in Science and Mathematics

Schema theory has not been applied only in reading comprehension. Research in other fields includes science and mathematics, as well as others.

In science, research on the creation of naïve theories, or misconceptions, has often been the focus of schema-related research. McCloskey (1983), for instance, described naïve theories of motion, which he concluded people extrapolate from everyday experience. He pointed out that these theories are well-explicated, abstract descriptions (or schemas) of what should occur concerning the behavior of moving objects. He

described some of the commonly held misconceptions, but left their development and implications in the real world for further study. The main difference between McCloskey's theory and the reading comprehension version of schema theory is McCloskey's focus on misconceptions. In reading comprehension, both a child and a adult can have equally valid schemas, without either one being an expert or the naïve schema. While a child, or an adult learner, naturally modifies her schema as more information is gathered, all versions of the schema are workable and usable in the real world.

Additionally in the science field, researchers have looked at what they term *mental models* of various concepts. Gentner and Gentner (1983) discussed analogy-based models of electricity. They suggested that such analogies help people structure unfamiliar domains. We can think of this as an instance of using the structure of one content schema to help understand the content of another idea. Gentner and Gentner found their participants had one of two analogies to think about electricity. One analogy involved the behavior of water while other was about moving objects. Those with the water analogy performed better on battery questions while those with the moving objects analogy performed better on resistor questions. This is a good example of how different schemas have different affordances and constraints. Unlike a schema, the cognitive structure of the mental model centers around another real-world event or object, not on the object of present focus.

Marshall (1995) focused on problem solving in mathematics. Using the ideas of schema theory, she developed two software programs for teaching how to solve

arithmetic story problems. Looking at student work in the two different environments, she developed a mathematical model of schemas. Her previous work identified four components of schema knowledge for solving word problems: identification, elaboration, planning, and execution knowledge. There is little difference between her use of schema theory and that used by Anderson, Pearson, Mandler, and so forth. Her four components are similar to Anderson's (1984a) six functions of schemas.

Classroom Schemas

Most research in schemas has focused on specific bodies of knowledge, such as reading, physics, or arithmetic problems, as discussed above. However, as indicated previously, Pearson (1982) described schemas as encompassing the entire realm of a person's interactions, not just interactions with a specific school subject. Since the present study looks at how students come to understand a new learning environment, a particular interest is schemas of the classroom. Much research has been done on students in the classroom and how they interact there. To discuss these experiences, terms other than *schema* have been used such as activity segments (Shuell, 1996), rules for classroom discourse, or classroom routines. An exception is Leinhardt and Putnam (1987) who did use the concept of schemas during their discussion of a model of the learner.

Someone who has spent time in school most certainly will have a concept of what happens in the classroom. It might involve the placement of objects such as students, desks and chairs, a teacher, blackboards, and so forth. It also would include interactions among the objects, such as how a teacher's lecture proceeds, including speaking, writing on the board, eliciting responses from students, and handing out an assignment (Leinhardt

& Putnam, 1987). Other activities in the classroom—or activity segments—might include recitation, sharing time, seatwork, small group projects, and others such activities (Shuell, 1996).

Both the general conception of what happens in the classroom as well as the knowledge of each activity segment can also be called a schema, since it is a structured knowledge of the objects, people, and actions involved. When a person enters a classroom for a new course, she will look for these objects and activities and expect them to be in certain places. A room with no chairs, for instance, would cause some momentary consternation and confusion. On the other hand, a lecture that proceeds as expected fits into the schema and is more easily dealt with. As Leinhardt and Putnam (1987) discussed, "A lack of structure in a lesson or a mismatch between the structure of an actual lesson and the structure of a learner's lesson schema can cause considerable difficulty for the [student]" (p. 567).

Being able to learn in the classroom environment requires familiarity with the activities happening and/or the subject being taught. That is, the student needs to have developed a schema as well as be able to use it. Doyle (1978) realized:

> It is conceivable that a student would fail to learn from a particular instructional setting, regardless of its "quality," because of an inability to recognize and interpret cues that signal which performances are being taught. (p. 185)

These cues are the signals to what schemas the learner should activate to understand the situation in general or the subject matter. In schema theory research, this process is referred to as schema activation (Rumelhart, 1980). Cues might be direct words from the instructor, actions from other students, or details of the subject matter (Leinhardt &

Putnam, 1987; Shuell, 1996). These cues are particularly important to use when a new or less familiar subject is being taught or when the student is in a new or less familiar learning environment. If cues are not used by the instructor, understanding by the student is less likely to occur. If cues are present but not recognized by the student, understanding is even less likely since the schema is unlikely to be activated (Shuell, 1996). Of course, if there is no pre-existing schema, or place within a schema, for a particular aspect of the activity or subject, that portion might pass the student completely, as will be seen in the present study.

Limitations to Schema Theory

One large drawback to schema theory and its acceptance has been a lack of comment on how novel events are understood and how new schemas are developed (Bransford, 1984; Marshall, 1995). Although little research has been done on the acquisition of schemas, it is obvious that after birth we no longer have a blank mind. There is something there on which to build. For schema theorists, the first interactions we have are the building blocks for future schemas. When we encounter a new situation or object, we attempt to fit it into an existing schema. If it cannot fit, we adjust an old schema, either adding or subtracting to it or modifying it into a separate schema (Rumelhart, 1980; Pearson, 1982; and others). This area is still ripe for research; investigation of developing schemas is part of the focus of the present research.

Bransford (1984) also brought up the concern that a focus on schema theory could cause teachers and writers to present or create boring stories to have texts that fit what children already know. In a similar vein, software producers could recycle the same ideas

over and over again. Teachers and parents could only select similar software for their classrooms and homes. To some extent this does happen and is commercially successful. For instance, the *Math Blaster!* Series (Davidson, 1986) has been produced for over a decade and continues to have new additions in the same vein as the original. Course developers could stick with just one type of course or recycle structure over all types of courses.[1] I believe it is a misinterpretation of schema theory to use only material with which someone is familiar. The popularity of the computer game *Myst* (Red Orb Entertainment, 1993), which had a unique structure among computer games when it was first introduced, shows that people can develop new schemas for new software structures.

Cognitive Flexibility Theory

Schema theory typically focuses on the application of a single schema to an event. For instance, someone has **a** restaurant schema or **a** classroom schema. Life is more complex than this, however. There are many different varieties of restaurants. A classroom is made of many different activities. New experiences may draw upon more than just one sort of experience. As researchers realized this limitation to schema theory, Cognitive Flexibility Theory was developed. This is an extension of schema theory dealing with the use of multiple schemas (Spiro, Feltovich, Jacobson, & Coulson, 1992; Spiro, Feltovich, Coulson, & Anderson, 1989). Cognitive Flexibility Theory describes how a person applies multiple schemas to understand a current situation. To some extent, this theory also answers Bransford's (1984) and Marshall's (1995) problem of the

[1] There is an argument for all courses within a program of study having a similar structure to facilitate students' organization and use of schemas. I would argue against using this

development of new schemas: New schemas are developed out of the appropriate parts of other schemas or by transforming old schemas to fit new experiences and circumstances.

Take the situation of a person using an online course. She might apply part of a schema for graduate course classrooms, part of a schema for how the Internet works, part of a schema for online discussions, part of a schema for in-class discussions, part of a schema for taking a distance education course, and so forth. The parts are (hopefully) the best and most appropriate parts of each schema at that moment for that interaction. Cognitive flexibility means "the ability to spontaneously restructure one's knowledge, in many ways, in adaptive response to radically changing situational demands..." (Spiro & Jehng, 1990, p. 165). CFT goes beyond schema theory in supposing that people do not just draw on concrete, already created knowledge structures. Rather, we can draw upon a plurality of previous knowledge and reassemble it to fit the current situation (Spiro & Jehng, 1990; Spiro et al., 1987). Spiro et al. (1987) describe the process:

> Rigid, monolothic, prepackaged knowledge representations [of schema theory] are replaced [in CFT] by flexible representations in which fragments of knowledge are moved about and assembled to fit the needs of a given context of application. Instead of prepackaged schemata, purpose-sensitive situational schemata are constructed, thus allowing knowledge to be used in different occasions for different purposes. The emphasis is shifted from prepackaged schemata to the ingredients for many potential schemata; schema selection is devalued in favor of schema assembly; storage of fixed knowledge is devalued in favor of the mobilization of potential knowledge. One cannot have a prepackaged schema for everything. (p. 181)

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structure across all courses in different programs or disciplines, however.

Schema Theory and Educational Software

The theories of text comprehension discussed above can also be used to think about educational software, including online courses. It will be easier at this point to speak about educational software in general for a few reasons. First, my previous research has involved educational software programs specifically. Second, little research has been done on online courses. Third, I believe this theoretical lens can help us understand users across all types of programs, not just online courses. I will later focus specifically on online courses.

We all have spent years attempting to understand a wide variety of texts and have a general idea what it means to be able to understand the written words. What does it mean to understand a software program? Understanding a program is in many ways analogous to a reader's understanding of a particular written text. An author writes a text, with certain goals, audience, message, and medium. Likewise, content writers, graphic designers, project directors, animators, developers, and others write educational computer programs. This group collectively is the author of the software. The software team has a particular goal such as helping the user learn to speak conversational French or develop mathematical thinking skills; a particular message or content which forms the events of the program; and a particular audience such as grades 2-6, health care professionals, or people facing breast cancer.

Recall Anderson's (1984a) six functions of schemas in reading comprehension discussed above. We can apply Anderson's functions of schemas almost directly to software. Just as a reader must assimilate text information, a user must assimilate

information from the screen. On the computer, however, this information may involve text, pictures, animation, movies, and sound (words, music, or sound effects). With many different things on the screen at one time, there is a lot to which a user could attend. A schema allows the user to selectively attend to pieces of the presentation. For instance, one schema might indicate that an animation is most important, while another schema indicates that text information should be attended to at this point. Inferential elaboration will enable a user to draw conclusions about icons and other symbols, such as that a question mark means a help section. With a schema, the user can search her memory for similar occurrences in other circumstances to help her determine functions of these symbols. When summarizing a text, the reader bases the summary on a schema, editing out unimportant information; presumably, the same occurs when describing a software program. A reader may add information from a schema that was not in the text (inferential reconstruction) when referring back to the reading. Again, this seems quite likely to occur with software as well. I did see these latter two occur during a study of children using educational software games (Paulukonis, 1998).

Just as a reader brings various content and structure schemas to bear in comprehending a text, a computer user can bring such schemas to her interaction with software. Just as there are different types of texts, so too are there different types of software programs. Educational software, for example, can include exploratory microworlds, drill and practice programs, video-games, strategy/planning activities, interactive books, productivity tools (such as word processing programs), and tutorials or courses, among others, as well as combinations thereof. Just as each type of text requires

reading in a slightly different way, each type of software requires interacting with the computer and thinking in a slightly different way.

For instance, *Math Blaster!* (Davidson & Associates, 1986) is a typical drill and practice program. A user faces a number of numerical math problems; upon typing in correct numerical answers, he is rewarded with a short video game involving shooting aliens or collecting space garbage. To succeed with the program, he mainly needs structural schemas for drill and practice and for video games.

SimPark (Maxis Kids, 1996), on the other hand, is an exploratory microworld that simulates the ecological environment of the nature park created by the user. She must maintain biological diversity through placement of plants, animals, and items for people. To succeed at the game, she mainly needs a structural schema for microworld simulations. When students first encounter a particular piece of educational software, including various components of an online course, they likely bring a variety of such structural schemas to their efforts to make sense of the program.

With educational software, we need to deal with two types of content schemas. First, there is the subject matter content, such as ecology, geometry, or social work. These content schemas would be the ones discussed above used in reading. In addition to educational content, many programs set the material in a specific situation or story line. I suggest using the terms *educational* and *situational* to distinguish these two types of content schemas.

For example, the educational content of *SimPark* is ecology; the situational content of the program is a park. What a learner knows about both things—her schemas for ecology

and for parks—can have an important influence on how she makes sense of, interacts with, and learns from *SimPark*. As I found in previous research (Paulukonis, 1998), two users can have a similar schema about ecological diversity but apply it differently with different schemas of a park. One child thought of parks as places for people; that is, her park schema had people as a main component. She focused on creating a place with camping areas, fountains, and benches. She placed few plants or animals, to the point of removing some that wondered in through the simulation's internal programming. However, she did place a variety of species, not just one plant or animal. She barely glanced at other sections of the program that included a species identification game and a field guide. Another child focused on placing plants and animals, that is, his park schema focused on nature. He carefully selected animals that could be used as food for larger animals. He placed trees and flowers that were part of that food chain as well. Along with relying on prior knowledge, he frequently checked the field guide for further advice. Both children appeared to have within their ecology schemas information about bio-diversity. However, their schema of a park was very different. These different park schemas led to very different interactions with the software and hence different conceptions of what the software was about and how to use it.

Although there are similarities, software is different from text. For starters, most recent software programs are not text-based. The best programs are those combining multiple media (hence, the name multimedia) such as graphics, text, sounds, and speech. Thus, the user is not just processing text, as she is when reading. The software user has

multiple demands on her attention (although, as noted previously, a schema would help her select where to focus this attention).

Software also has a more complex structure than many texts. Few programs are linear. Some software tutorials and some games may be but the vast majority of programs are not. Nonlinearity is one of the selling points of multimedia/hypermedia. Most texts, on the other hand, can be described in a linear fashion: x then y then z occurs and will occur on every reading. One software user's one interaction can be described linearly...but the next interaction probably will not follow that same path. Even interactive books are rarely strictly linear; most allow (or perhaps encourage) the reader to easily move to different parts of the book, play games within various pages, or to read it from "beginning to end." For other programs, such as a word processing program or database software, linearity and nonlinearity are not applicable terms. They are tools that have a structure, but do not have a story line.

Online courses may have more or less linearity. Some allow students to tackle course objectives in any order; others have set lectures to be viewed or read on particular weeks. However, few, if any, courses have a strict sequence that all students must follow upon each study time. If a student arrives at a classroom, he will participate in roughly the same sequence of activities as all other students in the class. When the same students take an online course, one may begin in the discussion room, move on to a help page, then go to a lecture page. Another student might begin with the guest professor's audio lecture, then proceed to the main lecture pages, and not get into the discussion room for a few

more days. Although any one section, such as a lecture page, might have a linear format within itself, the course as a whole does not have a particular linear arrangement.

With texts and with software, being familiar with the content or with the structure facilitates understanding. A user is more likely to understand, effectively use, and learn from programs where they are already familiar with something. For instance, being familiar with ecological simulation software (having a structure schema) makes it easier to understand simulation software in another field. Knowing a lot about ecology (an educational content schema) makes it easier to understand the simulation software when it is first used.

Overview of the Study

The concept of schemas based on past experience provides a framework usable by designers of online courses. Designers want their interface to be easily accessible. They want people to use the course and learn from it and be able to be effective with it. Knowing how people come to learn how to use a new interface can provide insight on how to design interfaces that are more easily understood. It can also give insight on how to advise people about using the interface, without changing the design. With this insight, designers could develop ways of activating appropriate schemas, through help sections, audio cues, or graphical layouts. Being aware of various schemas brought by their users could also help designers create additional ways of using the software, such as through providing different navigation structures.

Instructors developing online courses can also benefit from thinking about schemas for the same reasons. Although they may not be focused on graphics and layout, they

should be concerned with how their students are approaching their courses. Such information can guide them in selecting modes of delivery, exercises, and activities, and types of content.

A host of questions can be asked about schemas and online learning. What happens when a person encounters this new learning situation? How does she adapt other schemas and create a new schema? What does he bring from outside the interaction to help him understand? Does he relate the experience to other learning experiences? If so, is it to other online learning? To in-class learning? To other distance learning, such as video via TV or two-way TV linkups? Or does she bring Internet surfing experience? What is her expectation before starting the course? How do these expectations change? How does he envision the course and his learning taking place? How does this vision change over the first month or two of the course? What are people expecting when they come to an online course? How does this perception change over the first months of the course? What is their initial schema of the course? In what ways does the schema change and develop over time?

From this array of questions, I have focused on two research questions to guide this study:

1. How do students new to online education learn how to learn in the new situation?
    - What prior experiences are used to help make sense of the online course?
2. What is the initial schema of the course and how does it change?
    - How does the student's schema compare to that of the professor and the project leader?

- What features of the course itself or of the Internet seem to have the greatest influence?

In the next chapter, I present the methodology used and a description of my data analysis procedures. In Chapter 3, we meet the participants and hear the stories of their past experiences and their course experience. I provide concluding remarks and recommendations for further research and for producers of online courses in Chapter 4.

Chapter 2: Method

This study examined the experiences of students taking their first online course, Social Work 891: *Special Topics in Graduate Social Work: Children with Special Needs* (SW891), offered at Michigan State University (MSU) in Spring 1999. Five students, their instructor, and the course developer were interviewed over the course of one semester. The instructor and developer interviews focused on the development process. The student interviews focused on their expectations for and experiences with the course, how these expectations and experiences changed over the semester, and how past experiences influenced their interaction with the online learning setting.

Overview of the Site

MSU offers online courses through its Virtual University (VU). VU refers both to the development lab that creates the courses[2] and to the courses themselves. Rather than being a separate unit of the university to which students apply, VU supports the development and administration of courses offered by regular academic departments in the university. VU courses are offered in many subject areas and at all levels of instruction, including undergraduate, graduate, training, certificate programs, and continuing education. VU began with one online course in 1996. In the 1998-99 school year, VU offered approximately 22 Fall courses, 31 Spring courses, and 28 Summer courses (some were offered more than one semester).

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[2] The term *course* may also designate seminars, training workshops, and conference proceedings produced by or offered through VU.

The VU staff includes directors, project leaders, developers, graphic artists, programmers, and support staff. Each project leader works with the course faculty and their staff to develop a Web site for an individual course. The resulting course site may include content pages, help pages, discussion areas for synchronous and asynchronous conversations, grade books, attendance records, evaluation forms, and online tests and quizzes. Additional features are frequently added to the VU suite to meet the needs of particular courses. The pages may contain text, graphics, videos, animation sequences, audio passages, downloadable, files, or anything else that can be found on the Web. VU courses may be entirely self-contained or may have external links to other online resources and Web sites. Most courses follow a typical semester format similar to an in-class timeline, having units arranged by weeks and with specific due dates for readings and projects. The occasional course specifies only start and end dates, with individual students determining the pace and timing of study.

For a year and a half, I worked at VU on the development of six courses and served as the project leader on five of those. I was not involved in the development of the course used in this study, although I knew the project leader and had met the professor prior to the study.

Participants

Study participants were all associated with one online course (described in the next section) offered by VU in Spring 1999. The course was selected by asking VU staff and instructors if they would be willing to participate in this project. Initially, another course was selected because of ease of access to the professor. Unfortunately, this course failed

to have enough willing and qualified student participants. At that time, almost a month into the semester, a second course was solicited, resulting in enough qualified participants to conduct the study.

Student participants were recruited through email messages sent to the entire class, requesting participation from those who had never before taken an online course. All five respondents who were qualified and had the time to participate were included in the study. They were all female, ranging in age from 26 to 46. Four were in the MSU Social Work Master's program; one already had her Master's degree. Four were taking the course to receive School Social Work approval (required to work as a school social worker in Michigan); the fifth student was taking the course as an elective.[3] One student dropped the class about two months through the semester due to health reasons. She requested to remain in the study as two of the three interviews had occurred and she had further insights to share.

The instructor, James,[4] had taught this course and related courses for MSU for the previous five years. His degrees include a Master's degree in Social Work and an Educational Specialist degree in School Psychology. In addition to being an instructor at MSU,[5] he is a school psychologist and social worker. He has worked in schools for about nine years and has about 13 years of practical work experience. This spring was James's third experience teaching SW891. He had taught the course once with another instructor and once on his own. By his own admission, James is not a teacher by training. He had

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[3] The fifth student in these two cases was not the same person.
[4] All names used in this report are pseudonyms.

never developed an online course before although he was an assistant teacher for another online course in the School Social Work series the previous fall. He bought his first computer shortly before the previous fall semester. He had never taken an online course or any other distance education classes.

The project leader, Joan, had been employed as a graduate assistant at VU since the previous summer. This course was one of her first assignments. She had both a Bachelor's and a Master's degree in Computer Science and was pursuing a Master's degree in Digital Media Arts. She had used the Web since 1993 or 1994 and had created numerous Web pages. Although she had been a teaching assistant, she had not been responsible for the creation of the instructional materials or lectures. She had never taken an online course or any other distance education classes. Joan had no background in social work and was not familiar with the content on the site.

Overview of the Course

Special Topics in Graduate Social Work: Children with Special Needs is one of three courses in a series taught at MSU by the Social Work Department. A social worker who takes these three courses is approved by the State of Michigan to be a school social worker. Such approval, which also may be obtained in other ways through other colleges, is necessary to work as a school social worker in Michigan. According to the course description on the VU Web site:

> This course will focus on identifying and working with children who present special needs. Children's learning and behavioral difficulties will be examined and

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[5] Technically, James is an instructor. However, the students referred to him as the "professor" and these terms are used interchangeably in this report.

> treatment needs defined according to an ecological, multi-systems, developmental framework. The course will address special needs within a broad range continuum from situational problems like family violence and parental divorce to specific disorders like Autism and Learning Disabilities.
>
> Methods of addressing the special needs of children, their families' [*sic*] and educators' [*sic*] within the complex interactions and relationships of home, school and community contexts will be offered. This is a required course for those who wish to pursue approval as a School Social Worker in the State of Michigan. (VU, 1999)

All three courses in the sequence were offered online by of Summer 1999. Another instructor previously developed one course. Joan and James developed this course in Summer and Fall 1998 and the third course in Spring 1999. As of Spring 1999, James would be teaching all three classes. At the time of the study, there were no plans to offer these courses in the classroom in the future.

The course online.

The online course was divided into five content areas:[6] (a) Course Syllabus and Introduction, (b) Conditions Affecting Children's Needs, (c) Specific Clinical Disorders, (d) Major Life Difficulties, and (e) Course Conclusion/Wrap-Up. Each content area was represented as a single Web page (i.e., all content was contained within one URL or file). For the middle three—the main content of the course—each page included (in order) a syllabus chart, a list of the topics on the page as internal links, the journal entry assignment, assigned readings and Web links for each subtopic, and narrative lectures for each subtopic. Some parts of the lectures were outlines taken directly from *PowerPoint* slides James had used previously in the classroom. Others were written from notes used

[6] Information about the course is taken from the developer and professor interviews as well as the course Web site. URLs for the course pages are not provided because the course is password protected. Passwords are required for all cost-bearing VU courses to limit use of the content to students, course instructors, VU employees, and invited guests.

in lectures. According to James, these text-based lectures closely approximated what he would say in a regular classroom. However, he realized during the interview they did not include as many stories of personal experience as he would be bring up in a classroom.

The main course content was entirely online when the semester began. Every link, lecture, and assignment was detailed. The only part of the course that was not provided was the actual case studies for three assignments. These were neither written nor put online until closer to the due date for each assignment.

In addition to the content area of the course, the Web site also included a grade book, a technical help page, *WebTalk*, and a class directory. The first two are self-explanatory. The latter two are described more fully below.

WebTalk is VU's proprietary program for asynchronous (at different times) communication within a class via the Web. It allows the posting of messages by the instructor and students in various conversations within any number of topics. With the project leader's assistance, the instructor is responsible for setting up topics and conversations before or during the course. In some instances, although not in the course, students are also allowed to create new topics or conversations. The program displays information about the sender of the message along with whatever text she has typed in. Files may be attached for downloading by classmates or the instructor for purposes of turning in assignments or sharing work with classmates.

Associated with *WebTalk* and the class directory is a system of profiles. These are created automatically for each class member but may be updated by each individual. Here, information such as preferred name, address, interests, and a photograph may be

posted. The photo and preferred name are used in *WebTalk* to identify a message's poster. These and other information are used to create the class directory, through which a student may email another student or view her entire profile. The profiles are meant to provide a way for students to get to know their unseen classmates.

The course in the classroom.

In the classroom, the course was typically taught on two four-day weekends, eight hours each day. Students attended at on-campus classrooms and at other places all connected via two-way interactive television, which is used extensively in the Social Work program. Classroom time included lectures, small group discussion and activities, and presentation of research projects. While the entire course was mapped out ahead of time, James changed specific topics and commentary to fit the particular needs and questions of the students, something he did not do in the virtual course.

Data Collection

Interviews provided the primary data for this study. The professor and project leader were each interviewed once, shortly after midterm. Each student was interviewed three times, at approximately one-month intervals.

The professor and project leader interviews focused on their organization of and expectations for use of the course (see Appendix A for the protocol). The main focus of these interviews was to see the course from their point of view. We can think of them as the authors. As discussed in Chapter 1, readers more readily understand text when they hold and apply schemas like those drawn upon by the author. I hoped these interviews

would provide such information about the course developer's schemas. These interviews also provided information for describing the course.

The students were interviewed three times during the semester. Most of the participants lived over two hours drive from the MSU campus, had families, and worked full time. In addition, most were taking at least one other course in the master's degree program. Because they had all taken the course online to reduce driving time, some were hesitant to come to campus for the interviews. Due to the distance and weather, it was also difficult for me to go to all of them. Thus, some interviews took place in person and some via electronic communication. I conducted most of the interviews online using *AOL Instant Messenger* (AIM), a text-based chat program. Only one entire set of interviews (Susan's) were conducted in person. Two participants (Cora and Karen) had only online interviews. Two participants (Tonya and Rosalyn) had a combination of in-person and online interviews. One interview (Tanya's third) was conducted via email due to scheduling difficulty and an inability to use a chat program with which at least one of us was familiar.

The decision to conduct interviews online came when Karen was willing to participate in the study only if the interviews could be done online or through other distant means. The other participants either offered it as a possibility or readily agreed to my suggestion. Some had used *AIM* or other chat software previously. A couple were new to it, but did not indicate any difficulty in using it the first time. I provided them with links to download the appropriate file along with instructions to get started with the program. They all appreciated the freedom this mode of interviewing gave them. For

instance, one woman was able to keep an eye on sick family members during the interview. During another interview, she took a 15-minute break to get her children to bed. These activities would have been awkward or impossible in other interview situations.

Using online chat was preferable to telephone interviews because it provided a record of both sides of the conversation saved as a text file. This file was used in place of a transcription. To minimize the participants' concern over typing and spelling, I corrected spelling and punctuation errors in all quotations I used in this report.

The in-person interviews were audiotaped while I took notes. Transcriptions of sections were made when needed for detailed analysis or direct quotations.

The interviews, which lasted approximately two hours, consisted of a series of open-ended questions (see Appendix B). Rather than rigidly following this list of questions, I asked additional questions to follow up on remarks from previous interviews as well as adapted or removed questions to solicit responses more easily. These changes are indicated in the protocol. I had planned to conduct the first interview before the course began to discover their expectations of and initial schemas for the course. Unfortunately, a course and participants were not found before a month of the term had passed.

The Student Interview Questions

The first interview began with an assessment of the student's background with computers and the Internet through questions such as:

- What is your previous experience with computers? How comfortable do you feel with them?

- What types of software are you familiar with?
- Tell me about your experience with the Internet and the World Wide Web.

I also asked out about various educational experiences participants had before taking this course. As discussed in Chapter 1, such things as experience with the subject matter may affect their ability to apply an appropriate schema and to adapt to a new learning situation:

- What, if any, other nonclassroom classes have you taken (such as distance education courses)?
- What other courses in this or a similar topic have you taken?
- Have you taken other courses with this professor?
- What would you expect a course on this subject matter to be like? (This might include what books, topics, class format, professor-student interaction, and so forth.)
- Why did you choose to take this course virtually?

Questions about online courses were included because students' opinions about them may have affected how they approached the course:

- What have you heard about online courses in general?
- What do you think it means to take a "virtual" or online course?

Questions about information students had before the semester began included:

- What do you know about this course?
- What materials have you received about the course (including email, brochures, preview pages on the Web, course orientation, and so forth.)?

The interviews also included questions about prior experiences students might bring to the online interaction. In the first interview, these questions were asked first in terms of expectations. Then the questions were repeated in terms of what was presently happening:

- Please describe this course. What other experiences is it similar to in your life? In what ways it is like and not like these?
- How is your course like taking a regular classroom-based course?
- How is your course not like taking a regular classroom-based course?
- Would you prefer this course be in a classroom? Why or why not?

I also examined the organization of the specific schema being used for this course through the following questions:

- How is this course organized?
- How do you get around in the course? How do you navigate it? How did you figure out the navigation? What would make this easier for you?
- What do you do to attend class? How do you study for this class? How did you develop this "plan for studying"?
- What materials do you need for this course?
- What advantages are there to having this course virtual? What disadvantages are there to having this course virtual?

Asking a student about their likes and dislikes of the course can gave insight on their perceptions and expectations:

- In general, how comfortable are you with this course? ...with the content? ...with the technical aspect?
- In general, how much do you like this course? ... the content? ... the technical aspect?
- What do you like best about the course? What is the worst aspect of the course?
- How would you improve this course?
- If you could change any one thing, what would it be?
- What advantages are there to having this course virtual?
- What disadvantages are there to having this course virtual?
- If you could, would you take another virtual course? Why or why not?

I also gave them a chance to add any further comments about their experiences that might help me to understand their experience.

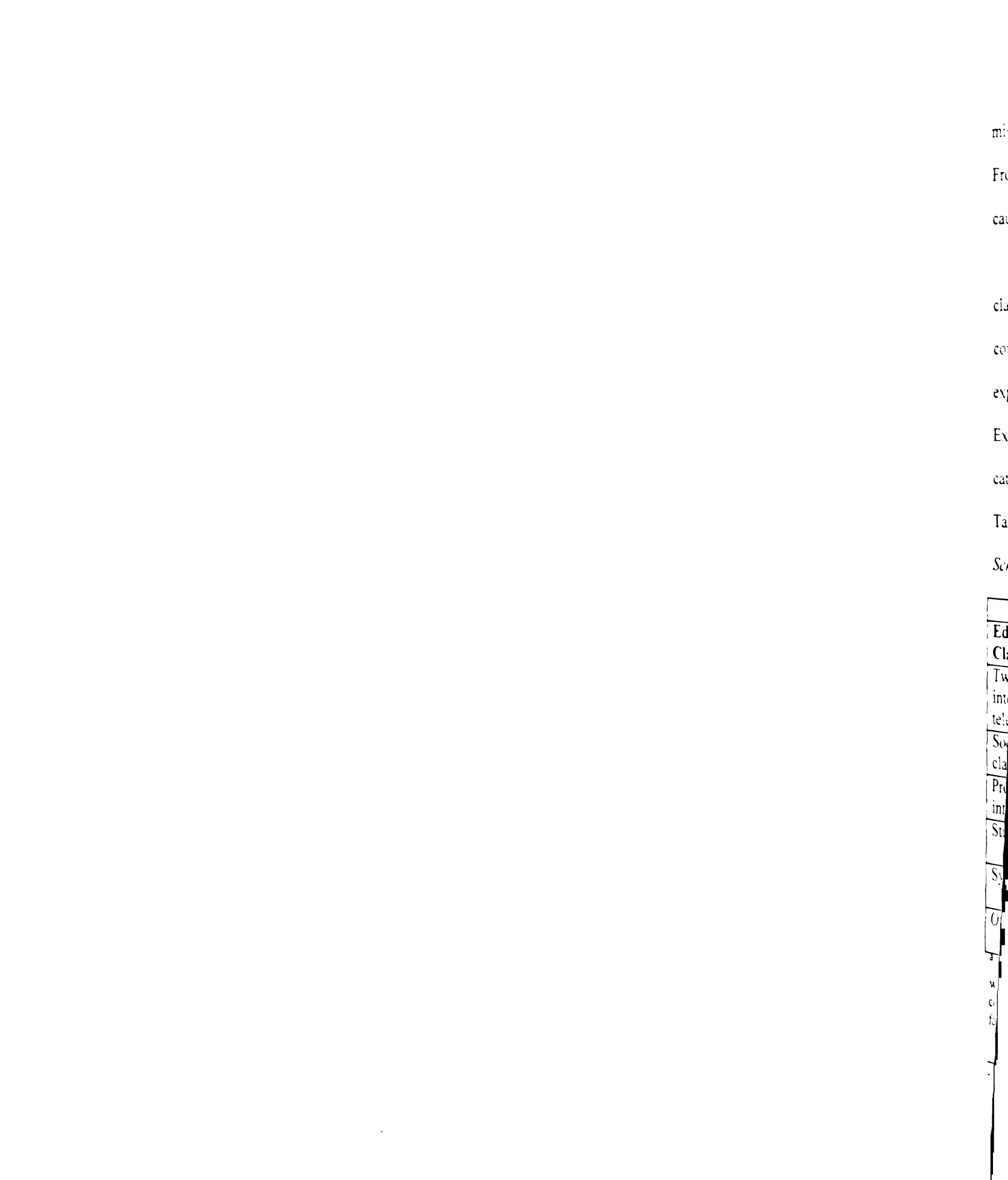
I initially planned to have participants finish each interview by drawing a graphical representation, or concept map, of the course's organization. Since so few interviews took place in person, this was abandoned after the first two interviews. Because I did not collect these from all participants, I did not use them in the data analysis. I had also planned to have each student show me the course online during each interview. Again, since few interviews were done in person, this kind of data was not collected for all participants. However, some information from this period was deemed useful with some of the participants and was used in the data analysis. Unlike the drawings, their comments during this period were part of the interview.

Data Analysis

Data consisted of my notes, transcriptions, and AIM text files of the interviews. Supplementary documents included the Web site for the online course. Information from the professor's and project leader's interviews was used to describe the course and to provide comparisons to the classroom version. A general description of the course was gleaned from this data as well as from the Web site.

The first step in my data analysis was to look through each interview transcript or set of notes for direct references to past experiences. I put these comments or my paraphrases of them into a table sorted by participant. I organized them first by a few general categories based on interview questions. Thus, comments about expectations were in one row and all comments about how class discussions worked were in another row. This organization led to seeing similar experiences across multiple participants. I also noticed when a participant mentioned the same experience during different interviews. From this data, I wrote descriptions of each participant and the main experiences she drew upon for the course.

The second step was to organize related experiences. For each one discussed in the descriptions, I listed the various reports from the participants. Some were about previous experience. Some of these discussed how this previous experience influenced a particular aspect of the course. I made assumptions from other comments at this point. For example, the participants talked about instances where things did not work. They discussed frustrations with the interface or contents and misunderstandings about aspects of the course. Some talked about portions of the course in ways that indicated they



misunderstood something. Students also discussed failures to access course materials. From these comments, I attempted to infer what past experience they were applying that caused the difficulty in understanding.

During this process, I identified four main areas of experiences related to (a) classroom-based education, (b) other education, (c) technology, and (d) features of the course. Within each area, I identified five distinct experiences[7] (see Table 1). These were experiences that multiple participants shared or that were very strong for one participant. Experiences that did not fit these five categories were filed into a miscellaneous *Other* category for each area.

Table 1

Schemas identified in the data.

Previously existing schemas				New schemas
Education—Classroom	**Education—Other**	**Technology**		**Features of the Course**
Two-way interactive television[a]	Two-way interactive television[a]	Chat rooms		WebTalk
Social work classrooms	Independent study	Email		Syllabus/syllabus chart
Professor interaction	Video-based course	DOS		Navigation
Student interaction	Other online courses	World Wide Web		Professor
Syllabus	Correspondence course via mail	Listserv		Student interaction
Other educational experiences		Other technology experience		Other features

[a] Two-way interactive television is listed in two cells because the Social Work Master's program uses two-way interactive television in many of its courses. Some experiences were related more to factors concerning the classroom environment while others were more closely aligned with distance education factors.

[7] It was purely coincidental that all four areas ended up with five sub-areas.

I assigned a two- or three-letter code to each the cell in Table 1. I also used a numerical code to indicate whether the event was a prior experience, an expectation for the course, or a present course-based experience. I used these codes to label each comment I listed in the second step. I also returned to the rich descriptions I had written in the first step and coded these as well.

Having assigned experiences to specific categories, I revisited the raw data of the transcripts and my notes. I pulled out additional comments and experiences at this time to add to the previously developed lists and tables. These also were coded.

The numerical coding led to my seeing that each past experience led into a present experience, which would be expected from the discussion of schema theory. I developed a new set of tables that set up each person's past experience next to the related course experience. At this point, I began to look at these as more than just experiences. I was looking at multiple experiences and their influence on a new experience. I was looking at more than just the facts and opinions about the experiences but also at how the student used this knowledge to interpret and understand the course. Thus, I began to refer to schemas, or organized structures of knowledge. I grouped these tables by schemas rather than by individual person. Now I began to see how past schemas shaped the course experience and led to adaptations of the existing schema or led to newly developed schemas.

As the language changed from "experience" to "schema" so did the actual entries in the table. Some experiences were not discussed enough in the interviews or were related to such a minor incident or course piece they did not warrant separate discussion. I

dropped these from discussion or merged them with other experiences to form a schema. Other experience areas I realized should be subdivided into more specific parts. In addition, the fourth column of course experiences was dropped since these experiences were viewed through the previously existing schemas. Therefore, they did not stand on their own as individual schemas, but were rather a part of the other schemas. See Table 2 for the final list of schemas seen in these five participants.

Table 2

Primary schemas discussed.

Classroom schemas	**Other educational schemas**	**Technological schemas**
Classrooms (similarities)	Two-way interactive television	Online discussion board
Locus of control	Television-based video course	DOS
Nonverbal communication	Independent study	Listservs
Class discussions	New school	Email
Rapport with the instructor		General computer experiences
Casual conversations		Affective issues regarding technology
Anger over lack of choice		

Chapter 3: Results

The evidence suggested that students invoked three broad types of schemas: classroom schemas, other educational schemas, and technological schemas. Within each area, different students have experienced different events. Hence, the five students as a whole brought little in common. However, their experiences are common enough to other people that the experience can teach us about how students approach an online course. This chapter describes some of their past experiences and how these influenced their perceptions of and interactions with SW891 online.

Because we are looking at what individuals bring to the online experience, let us begin with learning more about the five participants in the study.

The Participants

Cora.

Cora was a 41-year old female who took this course as an elective in her Social Work Master's program, which she started in May 1998. She was pursuing the School Social Work approval. Although Cora was a computer novice like some of the other participants, she was more excited than they were about learning more about the computer and the Internet. This positive attitude colored her interactions and made it easier for her to adapt to the course.

The independent study aspects of the virtual course also helped Cora understand the new learning environment. She particularly appreciated the control this type of learning environment gave her over what and when she learned, studied, and read.

Karen.

Karen was a 32-year-old female social worker. She was the only participant who already had a Master's in Social Work; she took this course to receive the School Social Work approval. Also unlike the others, Karen was not a regular MSU student. Not having taken other courses in the Social Work program, she did not know any of her classmates before this course. Although she had used computers for a number of years, she considered herself a novice user.

Karen had two major roadblocks at the beginning of the course. First, she interpreted a letter from MSU as indicating the course took place via email. It took a week of telephone calls with MSU until she finally got to the Web site. There, she faced an unfamiliar graphical interface. In her present job, she uses a DOS program on a daily basis, but is not familiar with other programs. She was unfamiliar with Windows and found it difficult to get accustomed to the graphical interface (using the mouse, clicking on things, and so forth.).

Rosalyn.

Rosalyn was a 43-year-old female who took this course as an elective in her Social Work Master's program, which she started in May 1998. Although she considered herself a computer novice, she appeared to be more in the middle of the scale, particularly in comparison to her classmates. She had used computers for about 10 years, including at work, home, and a home-based business. She used computers primarily for word processing and email. During the past year, she had also begun talking online with her family with chat programs.

Although she had heard rather favorable reviews of online courses from classmates, Rosalyn had strong technical fears going into the course. Her only previous experience with distance education was an attempt at a psychology video course via TV while she was an undergraduate student. She had such a bad experience she dropped the course after only a few weeks. She was worried this course would require the same type of strict time requirement.

Susan.

Susan was a 25-year-old female who took this course as an elective in her Social Work Master's program. She was pursuing the School Social Work approval. Susan considered herself a computer novice and had deep-seated fears of computer technology. She had used computers for about 10 years and email for about five, which was more than most other participants. However, Susan said she avoided email during the summers when she was not required to use it for classes.

While the other participants were happy to have the ability to take a course from home, Susan was extremely displeased about having to take this course online. As an on-campus student, she felt like she had been forced into the online course when she did not have a choice to take the course in a classroom. The other participants all lived away from the MSU campus and most of them had taken Social Work courses via two-way interactive television. These others were also used to two-hour drives to and from class, a strong point in favor of the online course they could take in their living room. Susan found none of these advantages to the online course.

Tanya.

Tanya was a 46-year-old female who took this course as an elective in her Social Work Master's program, started in May 1998. She assumed she was the most computer literate of the entire class, and she at least was the most literate in this study. Tanya was an expert computer user, having used them in her workplace for over 10 years on a daily basis. She used the Internet on a daily basis at work as well. This put her at the top among the participants in both Internet and computer use and expertise.

She expected a simple interface and site because she figured most other students would be Internet novices. While the site was more extensive than she expected, Tanya was the only student who found the course easy to understand and navigate. She also experienced no technical difficulties, unlike the other participants.

A self-paced learner, Tanya highly appreciated the independent aspects of the course. At the same time, the thing she missed most from a regular classroom was a sense of rapport with the instructor. Tanya was flexible in adjusting between independent aspects and those that were closer to the classroom. However, she found it difficult when one or the other schema seemed appropriate, but then certain expectations based on the activated schema were not met.

Classroom Experiences

Since the environment under study was a course, it makes sense that the students brought classroom experiences to bear upon their understanding. All of the participants were working on or already had a Master's in Social Work. They had taken psychology or Social Work courses in college and at least some graduate level Social Work courses.

These other classroom experiences shaped schemas of courses in general and of Social Work courses specifically for each student. Throughout the course, these prior schemas both helped and hindered the participants in understanding the new environment. Their previously developed schemas particularly helped the students' understand when the online course matched situations with a classroom-based course. Differences led to greater difficulty in developing a schema for the course, particularly for those who focused on these differences. The lack of choice between an online and a classroom environment also led to difficulty for one student.

The typical Master's level Social Work classroom, according to the students, includes such features as lectures, class discussion, small group discussion, papers, a final research paper, and presentations. Classes meet in a room at a specific time on specific days of the week. The professor and a group of students are all present in the room.[8] They chat with each other before and after class, or even during class, about their lives outside of social work. Students connect to the professor by virtue of seeing him in front of the class every day. He receives feedback on his lectures through questions, comments, nods, frowns, and other nonverbal communication. During discussions, the students receive similar feedback from both the professor and their classmates. This feedback helps them to establish where they stand in the course, such as how well they grasp the course concepts, whether they are more or less knowledgeable than other students, and so forth. The typical Social Work classroom is the typical college classroom.

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[8] The exception to this is the two-way video classroom discussed below in *Other Educational Experiences: Two-way interactive television.*

This online course also had lectures, class discussions, assignments, and a final research paper. However, the class never met in a room. The "meeting place" was instead a Web site containing content pages, a discussion area, and other resources. Each person attended whenever she[9] wanted or needed to on any day of the week at any time of the day, for however much time she chose. Students rarely saw each other during the semester unless they ran into each other in town or in another class. There was no time before or after class to chat with each other about life. They never saw the instructor, outside of a picture on the site. There was no opportunity for nonverbal communication. Class discussion happened via students posting messages to a classroom message board. When another student read the message, she could respond to it, but this could be anywhere from minutes to weeks after the original posting. Thus, responses usually were not immediate.

There are both similarities as well as differences in the above descriptions, which capture only a small portion of what classroom or virtual course schemas might contain. All the participants used their "classroom" schemas to understand the online course and navigate the uncertainties their experienced. At times, these classroom schemas aided this understanding; other times, they hindered understanding.

Similarities between the online course and regular classrooms.

All five students identified ways in which the online course was similar to a regular classroom-based course. These similarities made the course comprehensible to an extent because it followed classroom norms. That is, these students applied their previously

[9] Although there were men in the course, all participants were women. Therefore, I use

created classroom schemas to this course to help them understand the new environment. Aspects of the typical Social Work classroom which were the same in the virtual course include the presence of lectures, class discussion, papers, and a final research paper. As Rosalyn put it, some things exist in both classrooms; just in the virtual course, they are text-based instead of vocalized. These similarities helped each student begin to understand what she would be doing or would be expected to do although the environment of the course was different from what was familiar.

In general, these similarities were not very salient for the participants. Lectures, class discussion, papers, and research papers could be found in virtually any type of learning situation with some modification. The papers might be replaced with a project. The lectures might be by a teacher, an expert, or other classmates or read from a book. Class discussion might be within small groups or only within the class as a whole. Therefore, further explication of these similarities will not be developed. The students themselves said these were not terribly important to their understanding or misunderstanding of the learning environment on line. The differences are what made the greater impact on their schema development for the virtual course.

Individual students also identified other similarities. These will be pointed out in the following discussion of differences, as a point of reference for aspects that were still similar to the regular classroom environment but for which the difference was more important.

"she" when referring to the class's students.

While these parallels helped all the students adjust to the new course, the differences between a regular course and the virtual course were both helpful and hindering to different people at different places. Differences were regarded as helpful when students found the online feature an improvement over the comparable feature in a regular course. Differences were considered a hindrance when the online feature induced clash. The major differences included locus of control, nonverbal communication, features of class discussion, rapport with the instructor, and casual interactions with each other.

Differences: locus of control.

In a regular classroom, much of the control is in the professor's hands. She sets the dates and times for class meetings and determines what happens when during class time. Typically, all students participate in all activities in the same order, at the same time. The most say a student has is to refuse to show up for class. Atypical classrooms may put more control in the students' hands, but this is not the norm.

In this virtual course, each student chose whatever times and days she wanted to attend class.[10] She could choose five minutes Monday morning and 10 hours Friday or an hour every day of the week. It could have been over a lunch hour or late at night after the children were in bed. Once "at class," each student chose whether lecture, discussion, or reading would happen first, second, or at all. Lectures could be repeated as often as necessary, since they were permanent pieces of the course. A student could easily skip

[10] Some online courses have a different structure with selected meeting times in a chat room. These may be the only online aspect of the course or may be only occasional full-class online meetings.

over any information she regarded as familiar. The control was in the student's hands in this virtual classroom.

All five students recognized and appreciated this difference in locus of control. Rosalyn said that because of this, she can "turn off" the course when she wants to. "I feel like I am in control. I was afraid of [not having] that before I started taking the class." Going into the class, she worried she would have to apply her schema of regular classrooms with strict meetings times. After the class began, she quickly discovered the time was in her hands, and she no longer worried about using this part of the classroom schema. She easily was able to adjust the class attendance portion of her schema.

For Cora, this sense of control manifested itself in another way. "I didn't have to sit and pretend to listen to hours of lectures that I felt were not an asset to the class.... No, I didn't skip the lectures, but I didn't feel there was a lot of information in them. I didn't have to listen to someone drone on, just to hear themselves talk." Cora was able to control the course in her way—"attending" the parts of the course that she most needed for her learning and skimming those less important parts. She focused on the sections she was unfamiliar with and the discussion area where others contributed their experiences.

James would have been happy to hear that Cora did this. He said he had hoped that more-knowledgeable students would focus on the parts applicable to them while skipping the parts they already knew. He had thought about this specifically when creating the course: He knew it would be taken by Master's students during their two-year program as well as people who had been social workers for many years. James said,

> I did not, and have never, really placed a lot of critical importance on knowing that information. Both when I've taught in the classroom as well as when I taught on the

> Internet.... Especially in a class like this where the range of experiences and exposure to some of this stuff varies so much. There are some students who've been exposed to a lot of this stuff and they are going to spend very little time on it [because they are] trying to get this credential. Then there are other students who have never heard any of this stuff and want to spend tons of time learning all this information. And it's probably more than they will ever be able to learn in one semester's time.

The online course certainly provided for this flexibility, in a way a regular classroom could not have. However, James did not explicitly point this out to the students.

Cora and Rosalyn, at least, easily adapted to this difference; they even felt it provided a better environment for learning. Other students might not have adapted their schemas as easily. Someone who had stuck with her classroom attendance schema might have had one of two approaches. One would have been to create her own class schedule and always stick to it. This might include setting specific times for "going to class", organizing the sequence of events for that time, reading all the content, and participating in all discussions. Another approach would have been to become hopelessly lost without the guidance of a professor. According to James, some students in fact did call him almost weekly to check on their progress and on what they should focus on that week. None of the five study participants indicates they contacted James very frequently for these types of questions.

Differences: nonverbal communication.

Another difference between a regular classroom and a virtual one is the complete lack of nonverbal communication in the latter. In a classroom, all the accoutrements of live communications—gestures, facial expressions, head movement, and other nonverbal signs—are an integral part of the classroom interaction. These signals help students to understand the lecture or discussion comments better. They show reactions to what a

student has said—whether it is the professor's indication of approval or a classmate's dislike of their opinion.

Since people never saw each other face-to-face when online, these ordinary verbal and nonverbal cues were not available. Several participants commented on this difference. Rosalyn spoke for them when she said, "Body language has a lot of meaning and with the computer you miss all that." Another time she said "No face to face contact ... takes away the personalness." She said it particularly made it a lot harder to get her point across in *WebTalk* than it would in a classroom. Susan agreed, saying she found it more difficult to understand others without the nonverbal additions.

On the positive side, Rosalyn said the lack of nonverbal additions to the conversation forced her to work on her written communication skills. She carefully had to think out what she was saying and how she was writing it to be certain it would not be misunderstood. She also did not have immediate negative feedback on her comments that she might have gotten in a classroom. This made her feel freer in her writing at times (discussed further in the next section).

While nonverbal communication is generally accepted as an important facet of communication, these students knew it was more than just important to their future (or present) careers—it was vital. Rosalyn recognized, "In social work you need to 'read' body language. Without that, misconceptions can occur." At another time, she reiterated this, saying "The subtle ways ... a social worker knows what this person needs or if they are telling the truth or if they are lying—these things need practice in the class room." She thought it was a bad idea not to have this skill reinforced in the classroom.

Differences: class discussion.

All the students had participated in classroom discussions in other Social Work classes. In-class discussions are synchronous—everyone who contributes is present and contributing at the same time. The conversation is vocal and immediate, and is not permanent. While students might be expected to participate in the classroom for a participation grade, there typically is no specific criteria for the minimum number of times a student must speak to get a high grade. Discussions might occur as a whole class or in smaller split-off groups. The students generally acknowledged that certain people tended to dominate large group discussions while they themselves made greater contributions to small group discussion. They all knew what to expect in this situation; that is, they all had a class discussion schema.

The virtual course also included class discussion. The conversations took place in *WebTalk*, an asynchronous, text-based discussion board (see Chapter 2 for a description of *WebTalk* functionality). Students never saw each other while they participated in the discussion, unless they were together in another course. Each participated at her own time, by typing in a message for the class to read later. The message was posted to a Web page, one of a potentially long list of posts. The *WebTalk* page was a permanent repository of the discussion until the end of the course. In addition, in this course, a specific number of posts to *WebTalk* were required for the participation grade. Except for the last point, these are similarities shared by other online discussion boards.

For this class, the discussion forum consisted of seven topics: (a) Introductions, (b) Selecting a Topic for Your Research Paper, (c) Section I: Case Study Discussion, (d)

Section II: Case Study Discussion, (e) Section III: Case Study Discussion, (f) Posting a Summary of Your Research, and (g) General Issues, Questions & Discussion. From comments made during the interviews, I gathered that the students posted on a variety of topics. These included issues such as introductory statements about themselves, answers to the case study assignments, comments and questions on the course content, and discussion of other subjects that came up, such as local or national news events that were relevant to the course.

While each topic can have any number of subtopics, called conversations, this course had only one conversation in each topic. Under each conversation, all messages were displayed in chronological order.[11] While this might seem similar to the regular classroom, a post is not necessarily in response to the immediately preceding message. A person may post a message in response to any other message, or start on an entirely new vein at any time. There is no distinction as to which message any other message relates, unless indicated in the body of the message.

The differences between regular classroom and virtual classroom discussions caused patterns of contribution to change. On the negative side, students experienced repetition, intimidation, lengthy waits for responses, and fewer contributions. Positive benefits of the change included finding the discussions easier, less anxiety invoking, and more personal; having more personal control' and having greater access to different conversations.

Susan found the differences in the virtual discussion area a definite hindrance to her learning. For instance, discussions were repetitious. "It's easily redundant. I don't think it

would be that redundant in an actual classroom because ... if you say something I was already going to say, I'm not going to repeat what you said. What would be the point? But in ... *WebTalk*, you're getting graded on whether or not you say something. And there's a lot of redundancy, a lot of repeating. Simply because everyone's got to get their participation points." Karen also agreed that the discussions were repetitious in ways classroom discussions would not be. This repetition may well have stemmed from the procedure students used to compose their responses to the case studies. If each of them composed offline (in a word processing program) in direct response to the case, as opposed to responding online to a peer's response, redundancy was more likely to arise. Combined, these made the discussion more of an assignment area than a true discussion area on the issues. However, due to the explanations of *WebTalk* on the site and some of the topics set up it in, Susan was expecting to be able to use her schema for classroom discussions.

While in-class discussions are rarely recorded (if so, only for personal private use), the *WebTalk* posts are a permanent collection for the duration of the course. Any student easily can return to a post and re-read it at any time. For Susan, this meant she had to have perfectly thought-out posts. She felt intimated by this and so only posted the minimum required until a discussion about a national school tragedy at the end of the semester. She said she is rather quiet in the classroom as well. However, she felt more hampered in this environment than in the classroom. So she only posted when she had to,

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[11] For those familiar with other online discussion boards, this one was not a threaded discussion. This is discussed further later in the chapter.

rather than participating because she felt like adding to the discussion as she would in the classroom.

In class, any publicly asked question has an immediate response, even if the professor just indicates he will answer the question later or after class. The answers come publicly and vocally, in the same manner as the question. *WebTalk*, on the other hand, is not immediate; responses can come days or weeks later. Because the course is accessed via the Internet, it is also easy to respond to a question privately in email rather than via a *WebTalk* post. If this is done, there is no indication in *WebTalk* that the question has been answered.

Susan saw several questions posted that she had as well and awaited the answers. For some questions, answers never came. She hypothesized that James answered them in private email, but she had no way of actually knowing. In a classroom, she could have joined the student and John after class for the answer or said, "I'd like to hear the answer to that, too." Online, she was left alone, waiting to hear it publicly. She did not want to echo the question and be repetitious, which she hated seeing others do. At least one participant, Tanya, did use email to respond to her classmates at times instead of posting to the discussion. It is not known if the professor or other students did so.

Although she tends to be quiet in a classroom, Susan said her number of posts, between 6 and 10, did not seem like enough. It was hard for her to compare directly to how much she contributes in a classroom. It was certainly less when taking into account her participation in small group discussions in the classroom. Cora also recognized she talked less with the professor and other students in the virtual classroom. She figures she

posted to *WebTalk* about eight times—the minimum required. Since the discussions were not synchronous and immediately in front of her, Susan did not feel they were as necessary as in-class discussions are. That is, the professor was not standing in front of the room waiting for a response to a question so it was easy to talk less.

For at least three students, differences between classroom discussions and *WebTalk* were a positive benefit. One of the three pointed out that in-class discussions have immediate responses to her comments while there is a delay in the virtual course. Rosalyn said the greater distance in time in the virtual course made her more relaxed about making comments. "I find that I am more free with my comments and not as reserved. There isn't the instant nonverbal clues that you receive in a regular classroom from your peers or an instructor. You don't know if your comments are being frowned upon or cheered, but that makes it easier for me to speak—because I don't have the fear of immediate rejection. And I can rewrite to my heart's content." This extended time also helped Karen. She said, "You can formulate your thoughts more clearly and edit them before posting. You don't have the anxiety of public speaking either. I generally don't do a whole lot of talking in a regular class and actually felt more comfortable commenting in this format."

For all three students, *WebTalk* discussions were similar to in-class discussions. They were able to apply a portion of their discussion schema to *WebTalk*. However, being cognitively flexible, they adjusted the schema to fit the asynchronous method as the situation demanded. Their adaptations included giving themselves more time to think

about what they would say and worrying less about responses. It is probable they "spoke" more often in the online course.

In class, students can not easily avoid listening to others, even if those people seem to be the only ones ever talking. Karen felt the online situation allowed her more easily to avoid those she did not want to hear. "...I don't have to hang on every word of fellow classmates so I can decide which reading online I consider more productive." Online, she no longer had to spend time where she felt it would be wasted. Someone else might have felt obligated, or not able to change her schema, to accommodate this aspect. Karen, however, was easily able to adapt her schema of how to function in a course discussion and create a new one (or a modified one) for online discussions. This one involved focusing on those people and topics she desired.

Although she did not post as much as she may have talked in a classroom, Cora thought *WebTalk* was a more personal form of communication than the typical class discussion. In a way, the Web-based discussions were like writing to herself: "It is not face to face. It is almost like writing your feelings and thoughts in a journal. It is easier to be more open when you don't have people looking at you. You don't feel that they are judging by your looks. They are seeing you for your feelings and thoughts." As Cora saw it, this made it easier for her as well as others to speak freely and to express personal opinions or experiences. This is an example of using another schema—journal writing—in addition to a class discussion schema. Thinking of *WebTalk* in both senses helped Cora use it effectively. From her comments, it appears other students also spoke more freely in the online course than they may have in a classroom. This further points to the acquisition

of a new schema or adaptation of an existing discussion schema among the class members.

As an asynchronous communication mode, *WebTalk* allows many conversational topics to take place at the same time. For some people, this could get confusing when multiple topics occur simultaneously within the same conversation area. For Rosalyn, this was little different from in-class conversations. She noted that in *WebTalk* "a discussion may start about a couple topics and then carry on by different people. It could be confusing, but it happens in a classroom: This side of the class could be discussing drug-addicted teens and the other side about housing. On the computer, it is just a little quieter." She also pointed out that unlike in a classroom, a student could join in as many of the small group discussions as they are interested. Rosalyn was able to more easily use *WebTalk* because of her recognition of this aspect already present in her discussion schema. Unfortunately, her take on these multiple discussions came out in the last interview of the study; I did not have the chance to discover if any of the others found *WebTalk* confusing in this manner or recognized the same similarity.

Differences: rapport with the instructor.

In a regular classroom, students and the professor see each other every time they go to class. They occasionally talk privately together before or after class. They exchange glances during class to indicate understanding. They chat over coffee during a break. Students stop by for office hours. All of these are common occurrences for regular Social Work graduate course. Taken as a whole, these minor happenings help establish a sense of rapport between the students and their instructor.

None of these were possible during the online course. Since the VU course took place only online, the students did not meet the professor in person.[12] Although email could be used for private conversation, there was no class time to catch the instructor and know you would get an immediate response. There certainly were no opportunities to exchange glances or chat over coffee. There were no office hours—and most students lived too far from campus to come in even if there were. These differences made it much more difficult to establish rapport in the online course, as at least two students found to their frustration.

Tanya initially expected little contact and writing from the professor because she assumed the course would be like an independent study. Then the course started and she realized James had a presence. She said she then did expect to have a strong rapport with him because she always had a strong connection with the instructor in her courses. In other words, she attempted to apply a schema she had developed and used in her previously. Since she could not talk with James before or after class nor connect through in-class comments, Tanya attempted to establish this rapport in other ways. This adaptation to her schema included contacting him frequently via email—asking questions, offering advice, and requesting more input from him online. Unfortunately for her, she said, James did not often respond to her messages. She really missed this personal contact and connection; it diminished the experience for her. She did recognize there probably were too many students for James to connect with all of them. However,

[12] The one exception to this is Susan, who knew James from taking a previous course from him. She lived near the campus but did not see James during the course.

she had been able to establish rapport with all of her previous professors, regardless of the number of students.

Since Tanya effectively used her independent study schema for this course, this desire for rapport clashes somewhat with her application of that schema (discussed in *Other Educational Experiences*). This is another example that Cognitive Flexibility is an appropriate theory: Tanya did not apply only one schema to the course. Rather, she adaptively responded to the situation at hand. She did not think, "This is an independent study so I will not have contact with others." Where appropriate, she applied her schema of independent work. Where independence became the wrong schema for her to learn well, she attempted to apply her classroom schema. Unfortunately, this attempt was not met in exchange by the instructor.

Karen had the same regret. "I think I would feel [greater rapport with James] if there was eye contact and small talk before class, etc. It helped having a picture of him." Like Tanya, Karen did find some rapport with James but not enough to satisfy her. This disconnection with the instructor made the course overall more difficult.

In his interview, James acknowledged this problem as well. Since this was his first time teaching online, he realized he did not always do the right thing.

> There are students, myself included, who feel pretty secure about how they are doing in a class when they go to class every week, and they interact, and they get feedback and whatever. And they're, you know, feeling good about that based on those interchanges. Ummm, I know that's been a particular weakness of the class as I've done it so far is that I haven't been able to do that so far as to the degree that some people need more than others.

He also said he was committed to changing and improving his communication with students for his second online course.

Differences: casual interactions with others.

When we think about what goes on in a classroom, we usually consider such aspects as lectures, group discussions, textbooks, students, a teacher, and so forth. One aspect not often considered is the "down time"—time before and after class, and occasionally during class. This time is used for students (and teachers) to talk informally. They might share frustrations over buying the textbook or writing a journal entry. They talk about their son being sick, their spouse getting a promotion, and their daughter's soccer game. These casual conversations serve a purpose in making a connection among the students.

Since the online course did not have specific times or places for people to be, there was no "down time." Casual conversations tended not to occur because there was no nonofficial class time or space. Some online courses provide a synchronous chat room for students to access at specific times or whenever they are online. Here, students and the teacher can chat informally. This class, like most VU courses, did not have any live chat area.

For four of the participants, this lack was a major detriment. They felt they had no sense of their standing in the course because of this deficiency. They did not know if everyone else was a computer wizard (unlike they were) or if everyone else was struggling to figure out the navigation (like they were). They did not gain any personal stake in their classmates; they did not particularly care what their opinions were. Some of the students did know some classmates from previous classes, but it was a minority. One knew no one else.

Take Susan, for instance, one of the novice computer users. During the first days and weeks, she frequently found herself lost "in a maze," as she put it. One particular thing she could not find was the first case study, on which they had a major assignment. Although she searched the site repeatedly, she simply could not figure it out on her own. Then one day in the grocery store, she ran into a classmate she knew from a previous class. Susan shared her frustrations over the course. Shortly thereafter, this classmate sent her an email with the exact URL of the case study. Understandably, Susan was exceedingly relieved. She said that if this had been in a classroom, she easily could have asked a friend during a break where to find something as soon as she had trouble. However, with the course online, she did not have breaks with others...and so wandered the maze alone. This made it very difficult for her to develop a conception of the course since she was not sure where everything was online.

For Karen, this lack made her wonder where she stood in comparison to others. As she put it, "That's another thing about online course—you can't tell where you stand in relation to other classmates.... As we touched on, I don't have a good grasp as to if I am the only one in class behind, or if everyone else has their term papers done already." She keenly missed this sort of knowledge. It made it more difficult for her to connect to and understand the course. Since comparison of herself to others was a part of all of her other coursework, she was left with quite a hole in her classroom schema when she was trying to apply it.

It might be easy to say the students could have found out the answers to their confusion through emailing others in the course. In the case of Susan, this might have

worked since she knew others. However, her online course schema did not license such a behavior. Contact amongst classmates took place in-person for her. Email simply did not replace this in her cognitive structures. In this situation, Susan was not cognitively flexible and it hurt her learning. As far as Karen is concerned, she did not know any of her classmates before the course. Speaking with them privately through email might have been an invasion of privacy—much as one would not talk about these issues with a stranger in the classroom. It is much easier to ask for help from someone you know—a previous friend or someone met through previous casual interactions. In the virtual classroom, it can be very awkward to contact someone else, because you are contacting a complete stranger.

Anger over lack of choice.

Spring 1999 was the first time MSU offered this course. While the university did offer some courses concurrently in the classroom, this one was not offered in both modes at the same time. There were no plans to offer it again in the classroom. When the participants began the Social Work degree, not all were aware of the upcoming change in this set of courses. While the course is an elective to the general degree, it is required for those seeking to work as a school social worker in Michigan. These circumstances did not particularly affect most of the participants...except for Susan.

Susan said she felt "forced" into the online course. She wanted the School Social Worker approval; this was the last semester she could take the course and still meet her goal of graduating at the end of the summer. It did not seem unusual to take this course at the end of her schoolwork; that is, she had not put off taking it. Therefore, we cannot say

it was her fault for not taking the course until the last minute. Although she never admitted as much, she appeared very angry about this lack of choice. Unlike the other four participants, she always said she would not take another online course, if she had the choice. She was not looking forward to taking the last course of the sequence online that summer, which again was offered only online. As she put it, "It's a necessary evil." She recognized that some of her overall resistance to the course stemmed from the lack of choice.

While not a schema, this anger definitely hindered Susan's ability to be flexible and adapt to the new learning environment. That is, this affective response made it difficult for her to apply previous schemas or to develop new ones. More than any other participant, Susan focused on the differences between a classroom-based and an online course. She railed against these differences, using few of them to her advantage.

Other Educational Experiences

In addition to experiences revolving around typical classroom schemas, students also brought other educational schemas, including the use of two-way interactive television, televised courses, and independent studies.

Two-way interactive television.

Many of the regular Social Work classes at Michigan State use two-way interactive television to connect students and instructors at two or more sites. Usually, one site is on the MSU campus while the others are located around Michigan. Students take all of their classes at one site, but their instructors may be at other sites. All sites are considered the

same class, and hear the same lecture and participate in the same class discussion. The two sites would have separate small group discussions.

Although during class discussions students at all sites participate, often the camera does not show the speaker or shows her in poor light. Rosalyn compared this to not being able to see her classmates as they "talk," or post messages, in the virtual course. In the classroom, she can hear what a student on the other end is saying. However, the quality of the video may not good enough to be able to see that person clearly or the camera may not be on the speaking student. When Rosalyn noticed she did not have a feel for who was saying what in the online conversations, she accommodated by considering this similarity. She felt less bothered by her lack of connection with other students because she had previously experienced this in another setting. Others who did not recognize this similarity expressed more concern over the lack of connection to their virtual classmates.

Television-based video course.

About four or five years ago, Rosalyn signed up for a distance education course in psychology. The course was delivered over the local public television station, requiring Rosalyn and the other students to watch TV at certain times of the week for specific amounts of time. Rosalyn found this strict schedule to be difficult to follow and very restrictive. She quit the class after only a few weeks. Nevertheless, these few weeks left a lasting impression. As she waited for this virtual course to begin—and not having any information on how it would take place—she worried that it would require the same type of restrictive time commitment. While she wondered about and slightly expected this, she certainly did not hope for it.

Her fears were allayed during the first days of the semester. The course did not require students to be online at any specific times or for any specific duration. She and her classmates could attend class at any time of day and any days of the week and stay for five minutes or five hours. To Rosalyn, this meant she could turn the course on and off whenever she wanted to, not when someone else wanted her to. This was a vast improvement over the unfinished video-based course. She had been given control over the course. This feature was very important to her, as well as to others who did not have other distance education experiences, as was discussed above under *Locus of Control.*

Independent study.

While only some students ever take an independent study, most students have at least heard of them. Thus, even if they have not had the experience of studying independently, they are familiar with the concept and have formed a simple schema of what it involves. An independent study is usually undertaken alone, with only one student. There may be little or no contact with the instructor, particularly if it is taken as a correspondence course. The student has to set her own schedule for readings, assignments, and activities, meeting few, if any, deadlines. There are no lectures or classes to attend. Study materials are books or other written material. Assignments are typically papers. The student can work at her own pace and own time getting through the material. There are of course varieties on this theme, such as setting up deadlines that need to be met throughout the semester. Sometimes instead of just one student, a very small group will work with a professor, but meet rarely. The student and teacher may actually meet very frequently, if

the subject is quite complex to the student. However, the generalities are still there and are what most people would think of as an independent study.

Many of the above examples could be present in a virtual course. In particular, the student is usually alone when taking the course. Few, if any, activities take place with other students. With this course, students were not completely alone, as others were also taking the course although were not present. In addition, the instructor did set a schedule for assignments with strict deadlines.

Cora and Tanya recognized some of these aspects of an independent study in this course. The similarities helped them understand and deal with some aspects that distinguished it from a regular classroom course.

When asked to imagine describing this course to a friend, Cora said, "You are sort of on your own. What you learn and what you get out of it depends entirely up to you.... Where my perceptions and the readings are my teachers." After only a few weeks of the course, she found "that I am more apt to do the readings for this class and not do the ones for my other classes.... Because I feel that it is up to me what I learn [in this class] and I do not have someone lecturing me on the readings. I cannot do the assignments without the readings. I feel that more of it is up to me and I cannot rely on other students and the prof." Tanya, who particularly enjoyed these same aspects, echoed this sentiment.

Both she and Cora appreciated being able to work at their own pace and convenience, as they would with a true independent study. Their independent study schemas gave them a way to think about approaching the course, which helped them get the work accomplished. For instance, it made it easier to do the readings and assignments. They

realized how important these were to their learning in this class: these were the main points of contact between them and the instructor. In a regular classroom, Cora might be able to skip the readings since the professor's lecture would cover the same topics. In an independent study, however, the lecture does not exist. Similarly, in the online course the "lecture" was part of the readings (there were also assigned readings in several textbooks).

Cora thought the course was a good blend of independence and deadlines. While the day-to-day and week-to-week activities were only generally outlined, assignments such as journals and case studies had specific deadlines throughout the semester. However, since the deadlines were rarely absolute, it was much easier to procrastinate on readings and discussion in this setting than in a regular classroom.

For Tanya, the independent aspects were the biggest draw of the course. She said she always found the typical 15-week college course about five weeks too long. In this course, she was able to work at her own pace, completing a majority of the readings within the first three weeks. An independent, fast-paced, and self-paced learner, she was highly disappointed not all assignments were posted from the beginning so she could finish everything on her own schedule. The one improvement she would have made to the course would be to "have all the assignments out there at the beginning of the class. I felt I was 'held up' from progressing through the coursework because we had to wait so long for some of the assignment instructions to show up."

These two students combined portions from their classroom schemas and from their independent study schemas when attempting to understand the virtual course. It appears

from this and other situations within the course that Tanya and Cora can be considered to be cognitively flexible learners. That is, they applied appropriate pieces of different existing schemas to understand their new learning environment and to create new schemas.

New school.

Karen remembered what it was like when she went from college to graduate school. Having spent four years at the former, she knew what college classes were like. She figured graduate courses would be similar, but she did not know exactly what to expect. While some things would be the same, others would be different. ...But which things would be which? She thought about going from the classroom to the virtual course in the same way. While using this comparison may not have given her knowledge of exactly what to expect, it did provide a schema for approaching the new situation. While she did not delve further into this comparison, we can imagine that it gave her the ability to approach with an open mind and to take time to figure out what the new learning environment would be like.

Technological Experiences

The final set of schemas I found the students had brought to bear upon this virtual course is that relating to technology as a whole. The students used schemas based on discussion boards, DOS, listservs, email, and general computer experience to develop interaction modes with the virtual course. These schemas, like the educational ones, were both a help and a hindrance to the students. I also briefly discuss how their feelings about the course and technology affected two students' schema development.

Online discussion board.

Many Web sites feature discussion boards for their users. At the time of the class, Rosalyn had been a participant on one such board at *WebMD*. The WebMD site focuses on medical issues and includes threaded discussion boards on many of the same topics. When someone posts a message, he can choose to post a new message or to reply to someone else's message. Replies are marked as part of a thread, or set of posts, indicating which posts are follow-ups to which other posts. This enables users to see quickly what topics are being discussed in a particular area. The reader can easily choose to read or to skip an entire conversation. Many online boards are threaded discussions.

Rosalyn noted the similarities between WebMD's discussion boards and this course's discussion area. This recognition from a past experience helped her understand how *WebTalk* worked. On the other hand, one major difference caused her difficulty: *WebTalk* does not thread discussions. Instead, messages are listed in chronological order. Rosalyn found this particularly difficult to deal with, making it much harder to follow conversations within the discussion. She expressed a desire to implement threaded discussions if she were redesigning the course.

DOS.

Most of the study participants were regular Windows or Macintosh users. One student was not. Before this class, Karen had been primarily using DOS and the keyboard, not Windows and the mouse. For quite a few years, her job required her to submit daily progress reports through a DOS-based program. Until this course, that was her main

interaction with computers. This DOS application was text-based, with no hyperlinks, images or other graphical interfaces, or use for a mouse.

While the Web can be accessed from DOS through text-only browsers, this course was not designed for such access. This is also not a very easy way to use the Internet. Karen did use the Windows interface and a recent browser for the course. So, after years of DOS, she now faced daily interaction with a graphical user interface. This was not Karen's first use of Windows or of the Internet, but it was the first time she used it for something other than recreation.

Karen initially had trouble thinking about scrolling down the page with the mouse and the scrollbars and with clicking on things. For example, she did not realize the *WebTalk* page had additional topics besides the first Introductions topic for some time. She does not quite know how she discovered there were more: she said found it rather "by accident." Because of the page layout, I would presume only that topic appeared on the first screen of the page. Without paying attention to the scroll bar on the right side of the browser window, there is no way to know there is additional information on that Web page.

She also pointed out, "When I realized I could click on some of these things, I thought I should click on everything. The logo, title, etc. I thought I was missing things I was supposed to be doing. In fact I didn't realize I was supposed to be going to case study discussions" until she had spent a number of sessions online. Instructions on the homepage might have helped, she said. "I know people that know more about computers had no problem. I realized, too, I was used to doing paperwork on DOS program and

clicking was new to me." While she did not think of it in terms of schemas, she recognized her prior experiences had influenced how she interacted with the computer. They had shaped her expectations towards a text-based interface and so she was not easily paying attention to graphical cues. This is similar to the discussion of a teacher's cue during a classroom lesson discussed in Chapter 1. When cues are presented by the teacher but not recognized by the student, understanding is unlikely to occur (Doyle, 1978; Shuell, 1996). Similarly, the interface provided clues about the length of the Web page, but Karen did not recognize them and so miss portions of the class until she came to recognize them.

Since she was not completely unfamiliar with Windows and the Web, Karen did click on things from the beginning. Otherwise, she would never have gotten past the first Web page, which she did since one of her problems was with *WebTalk*. At some point, after realizing that something she did not expect to take her somewhere did, she tried "clicking everything." While this is obviously an exaggeration, I expect she tried various images on the pages and everything underlined, even if she was not sure she really needed to follow a link. Some images were not links, such as colored bars separating subsections on the lecture pages. All underlined text was a link, although it was not always clear (to me, and, as I discuss in the last chapter, to the students) where the links would go.

The evidence shows Karen was trying to understand her environment but had no clear schema to guide her. This could also be an example of schema over-generalization (Pearson, 1982). We see this commonly in the everyday life of a child. When a child's only experience with animals is with a cat, she will call all furry animals cats. Gradually,

she recognizes she needs different, specialized schema for cats, dogs, hamsters, and so forth. This is not limited to children, of course. Adults frequently do this when learning, be it about a new environment, program, or people. It appears that Karen over-generalized as she began to build an understanding of how the links were set up in the course.

Karen was familiar with the Web. She had been online for about four months before this course. She used the Internet for shopping, talking with friends, and finding information. Chatting via AIM was her primary use; this involves little clicking and scrolling. None of these activities was school-related. When browsing for personal reasons on the Web, she was not worried about missing a section of a Web site—if she did not notice it, it was of no consequence. However, missing something in the course did have consequences.

By mid-semester, these technical difficulties had faded and she was excited to take another course. As she commented, "Yes, I would take another class over the Internet without a doubt. [The] next one would be easier as all my technical difficulties would be worked out already." Thus, we see one example of the development of a schema over the semester. To understand exactly how this new schema regarding links and scrolling developed we would need to have studied many of her online sessions. Therefore, I cannot comment further about the development process.

Listservs.

In a class the previous semester, Susan and her classmates participated in a listserv to keep communication lines open between classes. A listserv is a way to send email to

many people at once (the list) by using just one email address. Outside of class, students would post email messages to their list address. The service would then send the message to everyone on the list, which was everyone in the course. This medium was used to discuss course issues beyond the walls of the classroom.

Susan saw immediate parallels between this listserv and the online discussion form when she began to use *WebTalk*. In both instances, the entire class including the professor were involved in (or at least privy to) all conversation. In the listserv, messages are sent back and forth via email. In *WebTalk*, the messages are on a Web page instead of in each student's mailbox. These similarities helped her understand *WebTalk* as a discussion forum.

Tanya also noted this similarity between the two electronic forums, as she had participated in non-class-related lists.

Email.

Karen was the only participant who was not a regular MSU student. She took the course as part of the Life Long Education program, a way to take MSU courses without being a full- or part-time student. After registering, she received a packet in the mail from MSU about her assigned student number. This information also stated she would use this number to access an email account from the university. Since this was the only communication she received from MSU after registering, the letter led her to believe that the course was email-based. As she said, "I had no idea how to attend the course. I've even [recently] looked over the stuff I got in mail and don't see any mention of going to

www.vu.msu.edu[13] to attend class. It seems I got so much material in the mail about this Pilot email that that was how course was going to be taught." So she waited, and waited, and waited, checking her email each day. The semester began and a few days passed, and she still had not heard from her professor. At this point, she began calling various on-campus places for help, including the VU Help Desk, the Social Work Department, and VU. The people she spoke with assumed she was attempting to access the course online and had difficulty giving her help because they each were talking about two different things. Approximately one week into the semester, someone at the help desk figured out that Karen did not know the course was on the Web. He gave her assistance in getting to the Web site.

A number of factors conspired against Karen. Information about the course lacked specificity. The MSU packet she received is automated for all Lifelong Education students. She registered incorrectly. Moreover, mail-based correspondence courses are familiar to her.

Karen did receive information about the course before registering—that is how she found out about it. As far as she recalls, it was a brochure from the Social Work Department heralding the ability to receive the School Social Work approval through online work only. However, since server locations (URLs) are not determined until a course goes into production, the URL was not included in this advertisement. Apparently, it did not include the VU home page either. It may have, but Karen does not remember

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[13] This URL is to the VU home page. Deeper in the VU site, students can follow a link to their course. Students can also use the direct URL to their course. However, the VU home

much about the advertisement and did not refer to it after registering. The MSU registration program does not show the URL for a course either. It simply indicates that a course is offered through VU.

Unfortunately, the MSU packet mentioned above is a computer-generated letter automatically sent to all new students, whether in a VU course or another course. It does not make sense to add information describing the VU home page and course attendance when the vast majority who receive the letter are not VU students. On the other hand, there is no other official notification mailing of course location for virtual courses.

Karen also registered improperly for the course, probably as a regular student or for no credit instead of the Lifelong Education designation. This mistake was discovered shortly before the course began. During the process of changing her registration, she was not registered for the class for some period of time. Apparently during this exact time, the instructor sent an email message to all the students giving them the URL and other information on the course. Karen, since she was not on the official list at this time, did not receive this message. The instructor did not send out any subsequent messages.

Thus, we have Karen, faced with a letter describing her email account and no other information from MSU. Although she did not say this explicitly, she has surely heard of correspondence courses offered through the US Mail. It was not a far stretch for her to imagine this course taking place completely on email.

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page is often given out initially, since students can view a preview and setup pages prior to the opening of the course.

General use of computers.

None of the five students was a complete novice computer or Internet user. All had spent at least the previous semester using a computer and being online. Only one student, however, had an extensive background with technology. For the most part, the other four spent considerably less time with the computer, less time online, and less time using the computer for school- or work-related projects. It appears that the extensive background made the course a different experience.

Tanya was the one expert computer user, having over 10 years of experience using computers at both home and work on a daily basis. Familiar with some of her fellow students, she knew in advance they were considerably less experienced than she with computers and the Web. Tanya reasoned that their professor would assume the majority of students were computer novices. Therefore, when looking forward to the course, Tanya expected to find very little information online. She predicted there might be one Web page with a syllabus of readings and assignments. Perhaps the class would receive weekly emails from the instructor with instructions just for that week. There would be little interaction with others even via email. Certainly there would not be lectures or large amounts of information online. All of this would fit with her expectations about the ability level of most students in the class.

From descriptions of the course in this and the previous chapter, it should be apparent that Tanya's initial schema of the course was quite different from how the course turned out to be. For some people, this mismatch of schemas could cause difficulties in understanding. However, Tanya had few troubles with the course. She was easily able to

pass by the initial schema she brought and apply different schemas that were appropriate. Although I cannot claim a direct correlation, it seems likely that her extensive computer experience played a major part in her flexibility. She had used so many other programs and Web sites, she was used to shifting around from one schema to another to fit the situation.

For instance, Tanya was the only student to have no difficulty with the interface from the first day. After the course finished, she said, "I really felt as though I had it figured out within the first week of the class. The design of the course was user-friendly and it was simple to get from one section to the others." I believe, as did she, that her background with the Internet facilitated her entrée into the course. She had no difficulty understanding the syllabus chart even though the other students experience great confusion (discussed further in Chapter 4). She found the site extremely easy to navigate. She found the links in the banner image, links that no other student found without my guidance.[14] She was confident even at the first interview that she was aware of the entire course site and had not missed any sections. She compared figuring out this interface to figuring out a new piece of computer software, something she has done dozens of times. She also pointed out that when she got a computer 10 years ago, she taught herself how to use it with manuals and other books. Since she has done it many times before, it was not difficult to do it again on the Internet.

Her prior use also helped her understand when her frustration with the course was due to online aspects or to things that would have existed in any format. For example, she told

me about how difficult one set of assignments, the journals, were. She pointed out that the assignment was probably James' teaching style, not because of the online aspect. She did not think the assignments would have been easier in a classroom context. Other students did think the journals would have been easier in the classroom.

Other students, while not as sophisticated as Tanya, also appeared to use "computer use" schemas. Specific instances (DOS, email, and so forth.) have been discussed earlier in this chapter. One other student recognized a more general application as well. Towards the end of the semester, Susan suddenly realized she had been applying a previous experience with computers to help her with this course. Although angry and fearful about the technology aspects, she had previously had to get through frustrating times with a computer. The prior fall, Susan had started a new job for which she had to use a computer for various activities. Therefore, she had to learn to use it and could not just ignore it. She said, "I never, ever would have thought *I* would work [on a computer]! ...When I first started working there last September, I was totally overwhelmed. I was like 'How am I ever going to remember all these [menu] numbers?' Now it's like it's not an issue at all anymore" (emphasis hers). She had to keep trying when things did not work out—so she did. One particular thing she learned to do was to just shut down the program or even the computer and restart what she was working on when things got too discombobulated.

She compared this to figuring out the online course. In the course, she "just started clicking things" when she was not sure what went where or what was a link. When she would get stuck within the site and not know how to get to the page she wanted, she

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[14] One interview question was about the navigation banner. When I asked the question,

would close the browser, reopen it, and start at the home page. "Since that happened to me [at work], I'm not as intimidated by being caught some place. ...Now it's like 'I'm caught in a loop, it's not a big deal, I can get out of it.' ...You just have to figure out how to get out of it. Now that's a similar thing" to what happened to her online at times. She was out of her comfort level with the new computer at work but she figured it out and became comfortable. She recognized she used the same sort of self-talk and some of the same solutions to problems when she was again out of her comfort zone with another new interface for the course.

Affective issues regarding technology.

In addition to the schemas described above, affective issues also appeared to have an effect on two students' development of an understanding of the new learning environment. Each anchored a different end of the affective spectrum: one was angry and fearful about a virtual course while the other was excited to learn more about technology. The anger and fear appeared to make it harder for one student to adapt to the new learning environment. The excitement and enthusiasm appeared to make it much easier for another student to adapt her schemas and create new ones.

While Susan did not fail to understand the VU course, she did come to it with an extreme amount of antagonism. She owned up to her fears and resistance right from the beginning, telling me she almost did not participate in this study because she disliked the course so much. However, she thought it was important that the experiences of someone

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the other students indicated they did not know the image was for navigation.

who did not like the technology were a part of the study. I certainly agree as she is not the only person in this situation with these fears.

Susan's fears can be seen in a number of instances. She said she avoided email when it was not required for school, such as during a summer without classes. At the beginning of the semester, she considered herself an extreme novice in terms of computer knowledge and use. She expressed severe apprehension about the technical side of the course. She also stated that she simply did not like computers.

Throughout this chapter have been a number of examples of Susan's resistance to the course. For example, she focused on the differences between *WebTalk* and in-class discussions. She strongly missed in-person casual conversations. She was angry about having to take the course online in the first place. In the interviews, she focused more on the differences than the similarities between the classroom environment and the virtual environment. She did, as has been discussed previously, find similarities between other experiences and this course, but she seemed resistant to doing so. They had to be drawn out. When asked for similarities between this course and other classes, she once said, "Only that [James'] style is the same.... There isn't much for me that's similar. Because so much of it seems to be, to me, kind of stripped away from this. It just seems cold. Cold and dry... It's sterile, dry, cold."

Susan was the only participant to have this antagonism and was the only one to focus on differences to such a great degree. She also had the greatest difficulty understanding and adapting to the online course. I believe Susan's antagonism contributed to her resistance to adapting to the new environment.

On the other end of the spectrum was Cora. Like Susan, Cora was one of the computer novices. However, she found an honest enjoyment and excitement to learning new technology. Cora said, "Maybe at first I did [wish the class were in a classroom]. But I really enjoy this new technology. I find it interesting and fun. Now I am glad for this new opportunity to learn in a different setting. Classrooms can become stagnant and boring." She repeatedly said during the interviews how much she was enjoying learning about the Internet. During the first interview she commented, "I was computer illiterate and I enjoyed it that way. But learning how to use a computer has opened different avenues in my life." At least twice, she also said she enjoyed having the research interviews via AIM, which was also a new technology to her. Her attitude is summed up with this light-hearted comment from the first interview, "I still have a few difficulties, but I am learning how to work through them. Mostly by trial and error. Really mostly by error." This attitude seemed to help her when she did not understand the virtual course components. She tended to not get frustrated nor give up. She looked forward to figuring out the new environment.

Chapter 4: Discussion and Implications

Summary of Results

First research question.

My first research question was: "How do students new to online education learn how to learn in the new situation? What prior experiences are used to help make sense of the online course?" The short answer is that students gradually learn how to learn by being cognitively flexible and developing new schemas for the learning environment. As we saw in the last chapter, the schemas and experiences can easily be divided into the three areas of classroom schemas, other educational schemas, and technology schemas. Table 3 is a complete listing of the 17 primary schemas and affective issues I saw applied by these five students.

Table 3

Primary schemas discussed.

Classroom schemas	**Other educational schemas**	**Technological schemas**
Classrooms (similarities)	Two-way interactive television	Online discussion board
Locus of control	Television-based video course	DOS
Nonverbal communication	Independent study	Listservs
Class discussions	New school	Email
Rapport with the instructor		General computer experiences
Casual conversations		Affective issues regarding technology
Anger over lack of choice		

Like the schemas applied in reading texts, these schemas both helped and hindered as the students assimilated information on the screen, selectively attended to pieces of the site, elaborated and summarized in the interviews, and inferentially reconstructed the site when talking about it (Anderson, 1984a). All of the functions for which schemas are useful were seen in the last chapter.

These 17 are certainly not an exhaustive list, nor would they necessarily be found in all online courses. A two-way interactive television schema, for instance, would be applied only by students familiar with this mode of distance education. The average college student probably would not be likely to have experienced it. An online course without a discussion area would not activate class discussion schemas. Similarly, for a course with additional types of interaction or modes of delivery, we would expect other associated schemas to be activated. Other affective issues could also come up. Additionally, as the use of computers and the Internet becomes more prevalent in society, students will bring different and likely more technological schemas.

Second research question.

My second research question was: "What is the initial schema of the course and how does it change? How does the student's schema compare to that of the professor and the project leader? What features of the course itself or of the Internet seem to have the greatest influence?"

The first part of this question was difficult to answer because of the delay in getting participants. Although I did ask questions about their expectations, the initial expectations did not have a large influence on the course experience. Karen's experience

with the packet from MSU that led her to believe the course was email based is one notable exception. Once she was directed to the appropriate place on the Web, she dropped the email schema. The students seemed to have such a lack of information about the course that they did not have expectations developed enough to come out in the interviews.

Change of the initial schema was essentially not answerable either. All schemas for the course were more developed by the end of the semester, as would be predicted by any of the schema-based theories. Even if we take "initial schema" to be those that developed throughout the first part of the semester, I still did not gather enough data to examine the development of any one schema in depth.

At the phase of developing research questions, I thought I would be able to say that each student approached and used the class in a defined, specific way such as "like an independent study" or "like surfing the Web for pleasure." Throughout the data analysis phase, I came to realize that Cognitive Flexibility Theory rather than a simple application of schema theory provided a better explanation of my findings. No student employed only one schema of how the course functioned. To give some sense of this, see Table 4 for a list of the 17 schemas and the number of students showing evidence of drawing on or adapting each one. All told, the five students drew on 37 schemas, an average of 7.4 schemas per person. Certainly, no student tried to understand the new environment through one exclusive schema.

Table 4

Number of students evidencing each schema.

Classroom schemas	**#**	**Other educational schemas**	**#**	**Technological schemas**	**#**
Classrooms (similarities)	5	Two-way interactive television	1	Online discussion board	1
Locus of control	5	Television-based video course	1	DOS	1
Nonverbal communication	2	Independent study	2	Listservs	2
Class discussions	4	New school	1	Email	1
Rapport with the instructor	2			General computer experiences	2
Casual conversations	4			Affective issues regarding technology	2
Anger over lack of choice	1				

Similarly, I was not able to produce on "author schema" for the professor and project leader. There are instances where we can pick out similarities and differences between the professor and project leader and the students however. Some of these were indicated in Chapter 3. One other difference between the students' and the course developer's schemas was that the developer expected more technologically-experienced students. This seems to have caused some of the difficulties students had in understanding the interface at the beginning of the course. This is addressed more below in *Implications for Developers of Online Courses.*

The instructor, unaccustomed to creating online courses, attempted mainly to replicate his classroom-based course on the Web. Since the students primarily used Social Work classroom schemas to understand this course, this was in general a good

match. Lectures, assignments, a research paper, and place for group discussion were provided. As discussed in Chapter 3, these were the main similarities between the two classes. The mismatch came in other areas, such as students expecting a greater rapport with the instructor. Some of this seems less of a schema differential than a problem inherent in online courses, or at least a problem only overcome with great difficulty.

To some extent, the instructor's schema of a classroom course was the only one he consciously used during development. He had little previous knowledge of the Web, and even less of online courses. The project developer, on a similar note, had no previous knowledge of social work—neither of the field nor of courses in the subject. She also had little experience with online courses. Thus, rather than attempting to develop the course in a specific manner, she mainly worked out technical details of the course. I think it fair to say there was little developed on the "author" side of this course beyond transferring a classroom-based course to the Web. Therefore, beyond a few minor incidents, there was little to compare between the students' schemas and the instructor's and project leader's.

The most salient features of the course or the Internet were discussed in the preceding chapter. When I wrote the question, I wondered if specific technical aspects would have a great effect on the schema development. Later in this chapter, I discuss a few features of the course that caused great difficulty. I do not feel these were particularly related to schema development however. In addition, I did find that experiences with the computer affected the student's schema application. The student who had had the most Internet and general computer experience most easily adapted to the new learning experience. Tanya did not think anything about the course layout was confusing, unlike all the other

participants. Similarly, the student most excited about the new technology also found it easier to adapt her existing schemas. The student who resisted the online aspect and most feared technology had the opposite affective response—resisting adaptation to the course. Therefore, it appears that rather than any particular feature, general experience in the new environment most affected schema development.

Limitations to the study.

There are two sets of limitations to this work. First, there are limitations in the generalizability because of the participants. Second, there are limitations due to changes made in the methodology.

This study had a nonrandom, self-selected group of participants. The sample size was also very small, with only five students in one course. They were all women. None were the typical college age student, although they appeared fairly representative of the adult learner returning to school for a master's degree. I do not claim these students are representative of all online students.

However, what these five students do point to is that a wide variety of experiences are brought to online courses. Students were anywhere from very novice to highly expert computer users. They spanned a 20-year age range. Some were quite experienced in the subject matter and some much less experienced. Some students had used listservs or online discussion boards; others had used neither. It shows that students like these are taking online courses and designers need to think about them. There is no one type of "online student."

Also, the three broad categories of schemas emerging from the study seem sufficiently general and transparent to merit further application and investigation. As pointed out above, a different course with different online features would likely active additional and different specific schemas.

Secondly, due to circumstances beyond my control the methodology changed or did not provide all of the answers for which I was looking. As mentioned briefly in the second chapter, the initial interviews did not occur when expected. I had planned to interview the students before they had seen the course online, or within days of their first visit to the site. The first course selected for study did not have enough willing participants who had not previously taken an online course. Even if I had gathered students from this course, I was not able to make initial contact with them until about two days before the start of the semester. Even if students had responded immediately, it would have been difficult to meet with them immediately. When I switched courses and finally found participants, the students had been working on the course for up to a month.

I expect that if I had been able to interview students before they saw the course, they would have been able to explicate their expectations more clearly. Instead, after a month of exposure, I asked them to remember the time when they did not know much about the course. This is difficult in any circumstance. Many of their responses were colored by their experience with the course. Their responses to my questions were frequently interspersed by comments about the course as it was, rather than separating the experience from their expectation. Thus, it was very difficult, as I noted earlier in this chapter, to determine initial schemas.

Another drawback occurred because most of the interviews took place online. In the original plan for the interviews, I intended to have the student show me the course online. I had no pre-planned questions for this period. It was intended as another way for them to describe the course and how they used it. This was impossible to do with the online interviews. This data, particularly if I was able to structure the time as an actual course-time interaction, may have given deeper data on how they used and reacted to the interface. Direct observation of an event can often give greater understanding than self-reporting of behavior. In particular, insights may have been very valuable if I had been able to watch the student during her first interaction with the course.

Thirdly, I was not able to explicate the instructor's and project leader's schemas as deeply as I had originally expected. This is partially due to my change in time to a greater understanding of Cognitive Flexibility Theory. I came to realize that there could not be one schema for the course. I also simply did not gather enough data through the interviews to determine the variety of schemas used by the instructor and the developer. A longer interview or a series of interviews during the development stage would be able to get at this issue in greater depth. Or, as I indicated in the previous section, there may not have been much to the schemas in the course development stage.

Implications for Research on Online Courses

This study is only one small part of the beginning of online education research. There are many directions that still have been inadequately studied. The present study suggests a few that seem particularly fruitful to pursue in the near future.

We do need to continue in-depth studies students in online courses. Many of these students' experiences emerged only as the semester progressed and we revisited the same issue. The insights they shared and I inferred could not come from Likert-scale surveys or one-time interviews. More information on the development of schemas would come from observing students during their online time.

Two specific groups of students to study are undergraduate students and students starting an entire program online, such as an online Master's Degree or a series of courses leading to certification. The former I recommend because they are not represented in the present study. This group would be rather younger than the present group of students as well. If the study had been done on an undergraduate course with typical college students living in dorms, I would expect different results and experiences to have been influential. Whether this would change their outlook is unknown. They probably would have fewer experiences to draw upon. For instance, they would have had fewer college-level courses from which to form a classroom schema. Their experience with coursework in the subject would be less as well. Since undergraduates take more courses outside their major, we might have many students who have no background in the topic. Undergraduate courses typically have a different structure than graduate courses as well, such as focusing more on lectures than on discussion.

Students beginning an online degree program could have a different outlook because they are embarking on taking an entire series of courses rather than just one or two online course. They sign up for the courses knowing they will be studying online. They may be more technologically experienced since they self-selected to take such a program.

It would be very valuable to study students taking a second or third online course. In such a study, we should look specifically at how the first course influenced their expectations and adaptations to the new course. This study could follow the same students through the series of courses, and compare schema use and development. This would be valuable both across a series of courses, such as this course and its two companion courses, or across courses in different subjects or with different instructors. Courses with the same instructor are more likely to be similarly structured, facilitating schema activation—once students have figured out the structure in the first course, the second would be understood from the beginning. However, as James planned to do, subsequent course structures are often modified to some degree. Thus, the students would still need to adjust their schemas to understand the environment.

Studying students in courses in different fields and with different instructors would be an interesting study as well. One would be able to look at how well structured the schemas for online courses became with the first course and how easily adaptable the students were to the second and third courses.

As I interviewed the instructor, James, I thought for a while that it would have been more valuable to interview the instructors during their first and subsequent online courses. His insights were fascinating to me as a developer. Such a direction did not fit the scope of the current study but would fit a future study. Some pertinent questions include: What are their schemas for a classroom-based course? What are the professor's schemas for an online course—prior to beginning development, during the work, during the actual course, and subsequent to the course experience? How do they adapt their

course for subsequent semesters? This study could develop suggestions or even a program to assist instructors in their first-time development.

It would also be worthy to study the developers of online courses. Who are the people designing online education? What do they know and believe about the differences and similarities between regular classrooms and virtual classrooms? How do they implement these? What are their schemas for online education? How do they address student differences and experiences? How do they direct professors who have never worked with students online to develop an understanding of the unique qualities of online education? All of these questions' answers could help the development of courses.

Implications for Developers of Online Courses

We have seen that students bring a variety of schemas relating to classroom experiences, other learning experiences, and technology experience to bear upon an online course. In retrospect, these three categories of experience appear to be obvious. These issues, however, were not obvious to me when I began this study and had already worked on three online courses. They were not obvious to the project leader, who did not expect computer novices to take the course. They were not obvious to the course professor who had not considered comparing aspects of the course to classroom activities.

The point of this project has been two-fold. First, I have developed a way to think about the experiences students bring. In a way, I have developed a schema for thinking about student experiences—a framework based schema theory and Cognitive Flexibility Theory. Second, I have brought these issues into focus at an opportune moment—just

when online courses are burgeoning but little research has been done on them. As part of this focus, course developers need to become aware of the benefits of using the framework emerging from this study in their own work. I suggest several benefits, in the form of specific, concrete suggestions for developers.

Apply schema theory and Cognitive Flexibility Theory.

Schema theory and Cognitive Flexibility Theory will only help if developers actually use them to think about the experiences students will bring to the course. We must think about who the students will be as we develop online courses. Once we have an idea who the students will be, we can hypothesize about the experiences they may bring. Then, we can use those expected schemas to guide the development of the course structure. Technologically familiar students may breed a highly complex course with many plug-ins and varieties of navigation. Expectations of very little computer experience may lead to having just text-based lectures and a simple discussion area. If we expect students to come with a wide range of knowledge in the subject area, we might create divergent streams of course content. And so on. Recognizing that students can adaptively modify previous schemas leads developers to assisting students in doing so.

Develop explicit commentary.

Students with all types of schemas would be served by explicit commentary about similarities and differences between the online course and other possible experiences. This is a way to directly apply the results of the first suggestion. We developers have taken classroom-based courses. We are familiar with other distance education methods. We have participated in listservs and online discussion boards. We are intimately familiar

with the programs and methods used in our development lab. We should be able to helpfully describe them to the students.

The students who were able to compare positively an aspect of the course with another experience found it easier to use. Recall that Rosalyn found *WebTalk* similar to her experience with a discussion board elsewhere. She additionally favorably compared *WebTalk* to in-class discussions. Except for Tanya, Rosalyn was the most comfortable with the course discussions at the end of the semester. She connected outside experiences quickly to the course experiences and thus was able to apply a schema and revise as necessary. She had to put the work in to make these comparisons; they were not provided by the course developers or instructor. Those who did not notice these similarities found *WebTalk* more difficult to use.

Developers and professors who recognize these same similarities should make these explicit to students. For instance, *WebTalk* can be described as a place for class discussion. We could note how it is similar, with give and take among participants, the same types of topics, and the possibility for both large and small group discussion. We could also point out its differences, such as being asynchronous, having a multitude of conversations at once, and having a greater potential for repetition. *WebTalk* could also be compared to a listserve and other online discussion boards. The same can be done for any online discussion forum. We have talked at VU about how *WebTalk* simulates classroom discussions. We know it is like other discussion boards—and we know what is different among them as well. Within this course as well as in my experience as a developer, these similarities and differences have not been communicated to the students.

Comparisons among all the experiences described in Chapter 3 would have been of great benefit to these students. Other possible connections can also be explicated to the students; it does not require a semester's study to think of possible experiences and comparisons students will bring.

Yes, it would be difficult for a first-time professor to figure out all possible comparisons. However, with help from the project leader, many of these examples and ideas can be developed. Resources for professors working without the benefit of a lab like Virtual University would include other professors who have developed and taught an online course and other Web developers or users. Each comparison or contrast we can describe means an additional cu to the students to activate a schema.

Give more directions to the students.

An important suggestion for course improvement came from the students themselves. They wished for more direction on what to do with the course. This involved both technical issues as well as navigation and structural issues.

First, these students wished for more technical directions. Some students were not aware that links could be within images, for instance. Others were not familiar with underlining indicating a link. A few statements on the opening page can indicate types of links. Experienced users can skip these instructions.

For example, the top banner image on every page contained links to sections of the course, including *WebTalk*, the gradebook, technical requirements and help information, and the class directory. These links were within an image. They were not blue and underlined as text links are. For someone with Javascript enabled (which was expected of

all students, but never stated explicitly), when the mouse rolled over one of the four links, a descriptive tag and a check mark appeared. For about two months, Susan did not use this navigation feature. Of note is that she was the one student to use lab computers for access rather than a home computer. It appeared from her comments that Javascript was not enabled on the first computers she used, as she never saw a change in the image when the mouse rolled over it. Around midterm, she was certain the developers had changed the design of the image to include the check mark for an active link, which she was suddenly now seeing. However, Joan affirmed that the design had not been revised during the semester. It is likely Susan never would have seen the checkmarks, except for the interview question about using the banner for navigation. After being asked about it, she began to pay more attention to the banner. Even Tanya, the acknowledged computer expert of the group, did not realize the image contained links until she accidentally clicked the mouse on the gradebook link and was suddenly accessing a new page.

Others had no idea images could be links, so they had no reason to move the mouse cursor over the image or to pay any attention if they happened to cross over it while moving the cursor for another purpose. This is an example of having no prior knowledge with which to have formed a schema. The student certainly was not applying an incorrect schema; she was not applying anything.

A similar suggestion is to explain the overall site more clearly. For this course specifically, students had a lot of difficulty with two aspects. First, they were not sure they had found the entire course. It appears the professor and developer did explain the course sections at the beginning of the course on the syllabus page. However, this

explanation was not enough for the majority of the students. They found it difficult to know just what all was going on in the course and lacked direction in finding out if they were missing anything.

Another technical problem the students had was confusion over the syllabus chart, which was meant to function as the main navigation system for the course. All four more novice participants found the syllabus chart confusing or downright incomprehensible for at least a while (see Table 5, which is taken from the original appearing on most pages of the course).

Table 5

Syllabus chart.

Course Syllabus and Introduction	Conditions Affecting Children's Needs	Specific Clinical Disorders	Major Life Difficulties	Course Conclusion/ Wrap-Up
§ Course Introduction § Multisystems Perspective § Modes of Practice	§ Diversity Issues § Issues of Violence & Abuse § Health and Medical Problems	§ Behavior Disorders § Social & Emotional Disorders § Learning Disorders § Developmental Disorders	§ Truancy, School Failure, Dropping Out § Substance Abuse § Sexual Activity/ Teen-Pregnancy	

Online, each column was a different color. The first row of each column was a slightly darker color than the rest of the column. The content of every cell was a link, shown by the underlining. There was no division between cells other than the color differentials. As with this reproduction, the text of some links did run into the following link.

Take Susan's experience with this chart. At first, she would click the top item on each column and read everything on the page that came up. Then she returned to the chart and clicked the first subtopic, expecting a new page with new information. She was quite confused because what she was now reading looked familiar. This second link was an internal link, pointing to a subsection of the same page. Susan, however, thought each link in the table was to a different page. Rather, as she came to figure out, each column was a separate page. Each link in the column was to subsections on that page. The developer used the symbol "§" to indicate this, but the symbol was not explained anywhere in the site. While I recognized the symbol from past experience, none of the five participants seemed to understand it.

Karen was even more unfamiliar with links. She did not realize for quite some time that the syllabus chart was links to the topics. She simply saw it as an informational chart on each page.

At least one student thought each cell indicated one week's topic. Although the cells were not labeled by weeks, they had no other labels. She was likely familiar with classroom courses that had a new topic each week of the course. She later realized each cell was simply a subtopic to the main course topic. As she read the pages, she saw that subtopics were not inherently divided by weeks. One could choose to separate them in that way by structuring reading to correspond since each subtopic had a separate lecture section on the page. It however appeared that in general the students read all the lecture material for each topic all at once. This was not necessarily in one setting but also not waiting for a new week of the calendar.

Students suggested revisions to the chart. A paragraph describing the functionality of the chart would have helped most. One student wished sections, such as Intro, Section 1, Section 2, and so forth., had labeled the columns. Then, she would label the subsections as in an outline (a., b., and so forth.), so that it would be obvious the lower rows were subsections not additional topics. I recommend both suggestions.

Include a chat room.

Because Karen knew from experience that talk and discussion are primary features of a Social Work classroom, she expected the virtual course to be a chat room. In this setting, talk and discussion would necessarily be the primary feature. Although others were not explicitly expecting a chat room feature, most of them later expressed the wish that there had been this type of environment in the course. A chat room would have provided immediate feedback, for instance. It would also have given them a greater connection to their classmates.

Include time for orientation to the online environment.

In a regular classroom, a professor will usually spend at least the first day discussing the course with his students. He might introduce himself, pass around a syllabus and office hours, go over each textbook, and have students introduce themselves. If the course is offered in an unfamiliar location, such a laboratory, he will give a tour, pointing out important features and locations of necessary items. Students are then given time to familiarize themselves with their surroundings.

The same care should be taken with an online course. If the first class or first week would be devoted to introducing the course in the classroom, at least as much time should

be devoted to this online. Students need time to understand the syllabus—both how to locate it as well as what is in it. They need time to find their way around the course site—an unfamiliar location. The professor should certainly detail carefully where everything is located at the least. Other VU professors have found making an assignment of looking at each course piece to be helpful.

This introductory time also allows space for students who have difficulty finding the course, as Karen did. Having had a stressful time finding the new environment, they would now have a little less stress, knowing they still had time to familiarize themselves with the space instead of being behind in course content.

Present attempts to address issues at VU.

During Spring and Summer 1999, VU began addressing at least one of the above issues. Concurrently with this research, another project leader, Marcia Witt, was developing what has become known as *How2VU* made up of series of VUnits. The VUnits are a modular set of help units covering technical issues of VU: activating the system ID/email account, accessing the course, downloading and using specific plug-ins, using *WebTalk*, and finding help for other potential technical issues. As a whole, these units make up the general *How2VU* that may be used by any student interested in VU who has either not signed up for a specific course or who has not received a system ID. In addition, each course producer uses the applicable VUnits to create setup pages. These pages include only those units the course needs. Thus, SW891 would include the section on using *WebTalk* but would not include the VUnit on using chat software.

The students who were novice Internet users would have greatly benefited from the VUnits. For those who did get to the Web site (everyone except Karen), these would have clearly explained the technical details. For instance, they would have been aware of how *WebTalk* worked as a discussion forum. These units would have eased some of the technical fears as well as giving the students clear directions for getting started in an unfamiliar experience.

For Karen, who did not know the course was on the Web, this would have been of no benefit prior to the course. However, it is easy for developers to add VUnits at the beginning of the course or at least a pointer to them in the Help section. Then, whenever a student does get to the Web site, this setup information is available to them and pointed out immediately. They are also available during the course when a technical difficulty shows up or a new plug-in or other software is added to the course.

VUnits presently do not address the other side of explicitness—that of explaining how aspects of the course are similar to and different from other experiences students may have had. The VUnits are designed as technical help sections only. There are occasional comparisons, but these are not the focus of the units. Based on the present work, I would recommend such additions to each VUnit as appropriate.

In addition to the VUnits, VU also requires a description of the course navigation on the setup pages. At a minimum, a copy of the main course navigation image is included with a description of each button's function. If there are different navigation structures in sections of the course, such as within the lecture pages, these navigational aids may be pictured and described as well. For this class, the navigation banner on the top of each

page would definitely be described. In addition, the syllabus chart might be included. Producers are also including these descriptions within the course, either in the help section or in introductory pages, or both.

As previously noted, I was a project leader at VU. As my research progressed through the spring and summer, I continued to work on a number of courses. I consciously attempted to apply the ideas and suggestions to these courses. At times, I introduced the ideas to the instructors I worked with as well. I hope the different choices we made are rewarding to the students who take these courses. I have also shared these recommendations with my fellow producers; I hope that further advances in helping new students continue.

I am now employed at another university; while I work on virtual courses, it is not with the benefit of a development lab such as VU. I hope that this work will continue to affect the courses offered by both universities.

APPENDICES

APPENDIX A

Questions for Professor and Project Leader Interviews

This protocol was meant to serve as a guide. Questions were adapted for the time, setting, and participant as appropriate. Since the interviews took place after some interviews with students, I adjusted the planned protocol as follows:

* indicates question added.

\# indicates question removed.

* Please briefly describe your course for me.

* How is this course taught in a classroom? May I have a copy of that syllabus?

How is your course like a regular classroom-based course?

How is your course not like a regular classroom-based course?

* What are you goals for this course (content, program, technology)?

How is your course organized?

How was the course designed?

What materials do the students need for this course?

How do you think students should study for this class?

How much time did you expect to spend online? How much time do you spend online for this course?

What does it mean to have a "virtual" course?

What advantages are there to having this course virtual?

What disadvantages are there to having this course virtual?

* What motivated you to make this course virtual?

* What types of students did you expect to have in this course? What type of technological expertise did you expect? What level of knowledge did you expect?

* What information did you provide to students prior to the course start and during the first week of class?

* How would you improve this course?

* Have you ever taken a virtual course or other distance education courses? Have you taught either before?

* What is your background or expertise relating to teaching or designing this course?

Draw a concept map of what your course is about, how it is set up, what you expect students to see and do.

APPENDIX B

Questions for Student Interviews

This protocol was meant to serve as a guide. Questions were adapted for the time, setting, and participant as appropriate. Throughout the study, some questions were added and some were removed. These are noted as follows:

* indicates a question added during the first interviews (some students were asked these during the first interview, others not until the second interview).

** indicates a question added during the second interviews (some students were asked these during the second interview, others not until the third interview).

*** indicates a question added only for the third interview.

\# indicates a question removed. Some participants may have been asked the question, but the answers were fruitless or they found it too confusing to answer.

What is your previous experience with computers? How comfortable do you feel with them?

What are the World Wide Web and the Internet?

What does it mean to take a "virtual" course?

How is your course like taking a regular classroom-based course?

How is your course not like taking a regular classroom-based course?

Would you prefer this course be in a classroom?

How is your course organized?

How do you get around in the course? How do you navigate it? What would make this easier for you?

How do you study for this class?

What materials do you need for this course?

In general, how comfortable are you with this course? *...with the content? *...with the technical aspect?

In general, how much do you like this course? *...the content? *...the technical aspect?

** What do you like best about this course? What do you like least?

How would you improve this course?

If you could change any one thing, what would it be?

What advantages are there to having this course virtual?

What disadvantages are there to having this course virtual?

*** Looking back over the semester, when did you first feel completely comfortable with this as an online course?

*** What other experiences do you think most helped you figure out the online aspect of this class?

If you could, would you take another virtual course? Why or why not?

Is there anything else you can tell me that would help me to understand your experience with this class?

Draw a concept map of what your course is about, how it is set up, what you expect to see and do.

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