

**Blending cognitive rule-based, process-based,
and context-based theories in the development
of online grammar instruction**

Marc R. Zaldivar

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Barbara Lockee, Chair
Michael Moore
Kenneth Potter
Terry Wildman

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ABSTRACT

This study proposes to blend contemporary educational research in order to design an online instructional environment. The goal was to create an environment that would better educate learners about grammar use in higher education, given the complexity of the rule learning that was being asked of them. By blending approaches from tested educational research on cognitive information processing theories, schema theories, and situated cognitive theories in order to determine how language rules are best learned, eight design principles were derived for the instructional environment. A prototype of the environment was then developed. Two series of formative evaluations, one with a group of subject-matter experts (teachers, linguists, and instructional designers) and one with a group of students, were run against the instruction. Overall, it was found that a database-driven website employing user-defined variables to customize the instruction for each individual user was a useful way to achieve the goals of the study.

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If indeed it is the mark of our species that we create our own environments in very considerable measure, then surely education is one of the most crucial aspects of that creation. (Bruner, 1983)

For a long time now, I have felt deeply that our work in education was to find all of the different ways that humans can explore our universe and to pass that knowledge on to the next generation. For me, this dissertation has been that journey. I have learned so much about education, about the human mind, and about what we do as educators, and I have so many to thank for that.

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Chapter 1: Literature Review

Need for the Study

It is well understood that educational theories form the underpinning of an instructional designer's activities (Gros, 1997; Jonassen, Mayes, & McAleese, 1993; Winn, 1997). One of the emerging challenges to the instructional design field is the correct selection and application of array of available theories to a particular design situation (Ertmer & Newby, 1993; Jonassen, et al., 1993; Reigeluth, 1996, 1997). As the needs of the learners and the complexity of the content grow, the choice of an appropriate theoretical framework becomes critical. This research seeks to find the appropriate blending of educational theories to apply to a particular educational context: language learning in higher education.

There is a clear and pressing need for rethinking the approach to grammar education, given both historical experience (Baron, 2002; Bartlett, 2003; Berman, 1979; Chomsky, 1966; Huddleston & Pullum, 2003; Myers, 2003) and recent developments in educational psychology (Bereiter & Scardamalia, 1987; Brewster & Klump, 2004; Brown, Collins, & Duguid, 1989; Bruner, 1996; Wildman, 2005). For many years, the behavioral traditions of education (drill-and-practice, rote memorization and repetition) have been the primary pedagogies of grammar education (Burley, 2001) and little has been done to reconcile some of the later traditions, such as schema theory and situated cognition, with contemporary

grammar pedagogy. While these latter theories have been applied successfully at other levels of writing instruction (Flower & Hayes, 1981; Graham & Harris, 1997; Hayes & Flower, 1980; Scardamalia & Bereiter, 1986), at the level of grammatical knowledge, the pedagogy has remained firmly within behavioral practice. The goal of this research would be to look beyond the particular content of grammar into the educational theories that would be appropriately applied to the learning of language rules.

For example, research has shown that behavioral techniques are employed successfully at early stages of learning (Berman, 1979; Fogel & Ehri, 2000; McCleary, 1995; Robinson, 1997; Rohde & Plaut, 1999; Scardamalia & Bereiter, 1986). However, there is also a need to bolster those practices as learners mature in ability (Ertmer & Newby, 1993; Jonassen, et al., 1993). If learners are expected to use a more sophisticated grammar, then the rules become clearly more complex (Bartlett, 2003). That rule system requires a slightly different psychological perspective. Schema theory and situated cognitive theories contribute useful perspectives for working with these higher-level rule systems (Armbruster, 1986; Bereiter & Scardamalia, 1987; Burkhalter, 1997; Cullen, 1996; Fashola, Drum, Mayer, & Kang, 1996; Gregg & Steinberg, 1980; Huspek, 1986; Murray & Kouritzin, 1997; Nagata, 1997; Nagata & Swisher, 1995; Zimmerman & Risemberg, 1997a). It seems promising, therefore, to study their impact on the higher-level grammar systems that college-level language learners are expected to adopt.

There is much national attention, from organizations like the National Council for Teachers of English and the National Commission on Reading and Writing, on bringing more grammar instruction into the higher education curriculum (National Commission on Writing in America's Schools and Colleges, 2003). Often, the instruction is not simply to fix the “inability” of students to write grammatical prose. Mechanically, the prose students write is often fine, but simple and predictable. Students’ frequent inability to make grammar rules meaningful needs to be addressed (Bartlett, 2003; Berman, 1979).

An entire recent edition of *College English* (August 2006) covers educational practices for writing courses to “cope” with the ever-diversifying higher education population. Given the large numbers of grammatical variations that the higher education student population represents, how could an educator possibly keep up with giving each student an individualized learning experience that best helps that student? Some instructional designers point to the affordances of Internet and database technology that can be applied to customize instruction for the user (Nagata & Swisher, 1995; Norman, 1993).

Working from a perspective of contemporary cognitive psychology, this research seeks to examine appropriate educational theories to determine how rules, or in this case the language rules called “grammar,” can best be taught to students in higher education, culminating in the development of a prototype for an online instructional environment. There is a long history of pedagogical arguments about how best to teach language rules, even what to consider

language rules at all (Baron, 2002; Bartlett, 2003; Burley, 2001; Chomsky, 1978; National Commission on Writing in America's Schools and Colleges, 2003). This research seeks to define language “rules” more precisely in cognitive terms. Cognitive information processing, schema theory, and situated cognition will be used to explain how learners learn the “rules” of language. A second step will consider how others have applied these instructional theories to design online instructional environments. Once those two steps have been achieved, a methodology for developing an online instructional environment that features these necessary theoretical principles will be described.

Cognitive Principles of Language Rules

One of the first steps in developing instruction useful to the online language learning is to reexamine the traditional understanding of the “rules” as described by linguistic research. It is important to keep in mind the difference between linguistics, which is a formalized study of a language system, and the languages that people speak and write (and students study). If the goal is to develop a system of improving instruction for a student-centered grammar, then a thorough investigation of that difference is in order. As Langacker (1973) notes,

When linguists describe the structure of the language, in no sense are they describing what people do when they create or understand sentences. The grammar of a language is not a recipe that can be followed in diagnosing the communicative needs of the situation, deciding what has to be said,

selecting a sentence to say it, and translating the sentence into speech. Nor is it a recipe for the hearer to follow when he monitors an occurrence and figures out what is being said. It is a description of the principles that specifies what strings of words are well-formed sentences of the language, a description of the intrinsic structure of the linguistic system. (p. 35)

In the class room, “grammar” borrows an understanding of the broader set of language rules from a more formal linguistic system like cognitive grammar proposed by Langacker (1991a, 1991b) and applies that directly to student learning.

Many years ago, Berman (1979) proposed the development of “pedagogic grammar,” (p. 279) whose goal would be to understand the nature of the rules of the specific language system, a subset of the larger set of available grammar rules, that students use and have access to. She proposed two central axioms for her grammar. First, a pedagogic grammar needs to take into account the “best insights available” (p. 280) from technical linguistics, so as not to become grounded in folk-teaching techniques (“rules-of-thumb” (p.281) is her preferred phrase). Second, a clear presentation of the rules is needed for students to learn a language, but rules they can understand and use.

Berman (1979) suggested a pedagogical, student-centered instructional design that would begin with examples, and use those examples to elicit a question about a linguistic structure. The answer to the question should suggest a hypothesized rule-formation that the teacher can then elaborate, offering the declarative knowledge set appropriate to contextualize the rule. Then, a task is proposed that will offer the learner repeated exercise. The repetition at this

phase encourages the learner and the teacher to elaborate upon the rule according to the four levels of language. Finally, the learner can be exposed to further practice to ensure the elaboration principles that were arrived at are understood. In this way, the learner and the instructor work together to blend the functional experience of language with the technical understanding provided by an informed instructor.

The following sections will explore the relevant research on the cognitive principles underlying language acquisition and language learning with the goal of applying the principles in the design of online language instruction. In particular, the theoretical perspectives of cognitive processing theories, schema theories, and situated cognitive theories will provide the context for the exploration. For each of these three, the principles of the theory will be outlined in terms of its relevance to online language learning. Then, each section will conclude with a review of literature that applies the theory to language instructional contexts.

These three schools take divergent perspectives toward cognition. In order to use them as a ground from which to explore language learning, each will be defined on its own terms. However, the ultimate goal will be a blending of the techniques indicated by the different perspectives into a single instructional design. Because of their historical positioning, cognitive processing theories will be discussed first, then schema theories come second, and the discussion of situated learning theories conclude this section.

Cognitive Processing Theories

Principles of cognitive processing theories.

According to general cognitive theory, there are two basic kinds of knowledge: declarative and procedural knowledge (E. Gagne, 1985; R. M. Gagne, 1985). Higher-order knowledge, such as language, is based upon these two structures (R. M. Gagne, 1985). Declarative knowledge is stored in memory as propositions, and procedural knowledge is stored as productions (E. Gagne, 1985). Significantly, E. Gagne (1985) notes how the declarative set of knowledge is stored in what appear to be linguistic structures. For example, consider this passage in which E. Gagne (1985) defines propositions using linguistic terms:

A proposition always contains two elements: a relation and a set of arguments. The arguments are the topics of the proposition, so they tend to be nouns and pronouns (although they can also be verbs and adjectives). The relation of a proposition constrains the topics, so relations tend to be verbs, adjectives, and adverbs... Whereas propositions always have only one relation, they may have more than one argument. This is especially true when the relation is a verb, because verbs often set up expectations for more than one argument. (p. 36)

In this passage, she explores the structure of declarative knowledge networks, and how the propositional elements relate to each other through expectations of meaning carried by the propositional elements.

E. Gagne (1985) is very clear, however, that these propositions are not language, in the traditional sense of oral or written language:

It is important to distinguish between words, phrases, and sentences, on one hand, and propositions, on the other. Words, phrases, and sentences represent ways of communicating ideas, whereas propositions represent the ideas themselves. Research suggests that we store information as propositions, rather than sentences. That is, we generally remember ideas but not necessarily the exact words used to communicate the ideas... Thus, it appears that people attend to and store the meanings of sentences (propositions) rather than the particular words used. (p. 39)

For the purposes of this review then, Gagne (1985) highlights two significant notions about declarative knowledge. First, humans store declarative knowledge in propositional networks that resemble the structures of language in their shared similarities to the functioning of nouns, verbs, adjectives, and adverbs. Second, people store sentences that they hear or read, not as direct memory of the sentences but as instances of propositional information, used to reinforce some relations and to weaken others. The notion of instances will become significant when discussing automatization of rules, because reinforced occurrences of rules allow the rule to become automatic, requiring very little cognitive or behavioral effort (DeKeyser, 1996).

Declarative knowledge is only the first step towards understanding basic knowledge structures. As E. Gagne (1985) notes, "Declarative knowledge is knowledge that something is the case, whereas procedural knowledge is knowledge of how to do something" (p. 48). There are two significant characteristics of procedural knowledge that make it different from declarative knowledge, and relevant to learning language rules.

The first of these is that procedural knowledge, unlike declarative knowledge, transforms information from one state into another (E. Gagne, 1985). Information taken in, usually in the form of sensory feedback (such as a red light) or written language (such as instructions), summons knowledge of how to act upon that information in order to achieve a meaningful conclusion (such as stopping the car or completing the assignment).

The second significant difference between declarative and procedural knowledge is the faster speed at which procedural knowledge is accessed. Once learned, procedural knowledge works automatically, faster than conscious awareness most of the time. E. Gagne (1985) describes, for example, the procedures involved in every day reading. The processes are so fast and automatic that they are beyond awareness. They can be brought into conscious awareness, but only with effort. Their default state is fast and automatic.

As procedural knowledge becomes more complex, intellectual skills become more developed. These intellectual skills grow as a person's knowledge networks become more capable of handling large problem sets. R. M. Gagne (1985) links the growth of complexity in intellectual skills to an individual's ability to manipulate symbols:

Reading and writing and using numbers are basic kinds of symbol-use learned in early grades. As school learning continues, symbols are used in more complex ways: for distinguishing, combining, tabulating, classifying, analyzing, and quantifying objects, events, and even other symbols (p. 47)

Symbol manipulation is central to language structures and functioning, and as such, the procedural knowledge associated with language should be central to the design of language instruction environments.

As humans learn higher-order rule structures using more mature intellectual skills, what must improve is the use of language itself. It is clear that the very principles underlying language's use are parallel to the principles used in higher-order thinking:

In a larger sense, the symbols used to represent the environment to the learner constitute language. A relatively simple intellectual skill in the use of language symbols is the grammatical role of the outcome form of a pronoun following a preposition ("from her"). A more complex skill is involved in using a metaphor ("seeking the bubble reputation"). Since languages are used to record and communicate the relationships (concepts, rules) that exist in any subject, the learning of such relationships can be expected to involve the learning of intellectual skills. It may be seen, therefore, that such skills are in many ways the most important types of capability learned by human beings and the essence of what is meant by "being educated." (R. M. Gagne, 1985, pp. 49-50)

R.M. Gagne (1985) calls attention, not only to the importance of language rules in the acquisition of higher intellectual skills, but also to the link between growing complexity of intellectual skill and growing complexity of language-use (from simple propositions to complex metaphoric constructions). If students are expected to gain the complexity of thought required of them in higher education (Bartlett, 2003), then they would do well to learn higher-order intellectual skills, such as higher-order language ability.

The connection between language and cognition parallels the goals of cognitive grammar as described by the research of Langacker (1991b). In fact, he

directly places his understanding of linguistic knowledge as a form of procedural knowledge:

The description of the language is nevertheless a substantive hypothesis about its actual cognitive representation, and linguistic investigation is an empirical enterprise, its claims to be tested against the facts of cognitive structure... The grammar of the language is a comprehensive description of that structure... The psychological representation of a linguistic system is also referred to by linguists as the grammar of a language. The present model identifies this "internal" grammar as its object of description, conceiving it dynamically, as a constantly evolving set of cognitive routines that are shaped, maintained, and modified by language use. A speaker's "knowledge" of his language is therefore procedural rather than declarative, and the grammar of the language is equated with certain linguistic abilities (mental, perceptual, and physical). (p. 56-57)

Langacker's (1991b) identification of grammar with cognitive procedural abilities highlights the importance of learning grammar *as* procedural knowledge. If humans learn grammar not solely as a declarative list of rules, but more as procedures applied to language, those procedures can be studied and instruction formed accordingly.

Cognitive research grew in the early twentieth century, becoming its own branch of psychological research by the late 1950s (Driscoll, 2005). The elements of cognition had always been a part of psychological research, even in the early predominance of the field by behavioral schools of thought. Driscoll (2005) discusses the cognitive interests of such early foundational psychological researchers as Tolman, Hull, Pavlov, and Vygotsky. However, she notes that

[w]hat was new in American psychology was the computer metaphor adopted for conceptualizing cognition. The birth of computers after World War II provided a concrete way of thinking about learning and a consistent framework for interpreting early work on memory, perception,

and learning. Stimuli became inputs; behavior became outputs. And what happened in between was conceived of as information processing... According to the cognitive information processing view, the human learner is conceived to be a processor of information in much the same way a computer is. (p. 74)

The parallel growth of information technology and cognitive psychology greatly assisted in developing research metaphors, precise terminology, and instrumentation for studying human memory and cognition. This metaphor remains a strong force driving both cognitive and linguistic research, particularly in the areas of artificial intelligence and intelligent language software (Anderson, et al., 2004).

Cognitive information processing theory is grounded in Atkinson & Shiffrin's (1968) model of human memory, which set forth a proposed system for memory that included three, main structural components. These are the sensory register, where information is taken in from the senses, the short-term store, also called "working memory" (p. 90), and the long-term store (Atkinson & Shiffrin, 1968). These structural components are connected by cognitive processes, some of which can be "modified or reprogrammed at the will of the subject," while others are "unvarying and fixed from one situation to another" (Atkinson & Shiffrin, 1968, p. 89).

After taking in information from the sensory register, information is encoded into the long-term memory by the short-term memory in semantic networks of various kinds. Declarative knowledge is placed into propositional networks of related propositional elements. Procedural knowledge, including

higher-order rules, are encoded into production schemas allowing the procedures to be recalled, employed, and adapted for new situations (E. Gagne, 1985). This is the fundamental cognitive information-processing (CIP) model (Driscoll, 2005), and by extension, the fundamental cognitive model for language rule production (Langacker, 1991b).

One of the most coherent and developed CIP models is called the Adaptive Control of Thought-Rational model (ACT-R) (Anderson, et al., 2004). The ACT-R model has a modular structure controlled by executive processing functions in the center. If language rules are more procedural than declarative (Langacker, 1991b), then it is within ACT-R's production centers of matching, selecting, and executing that language operates.

Anderson, et al. (2004) define the adaptive, complex nature of the production system:

[A]t any point in time multiple production rules might apply, but because of the seriality in production rule execution, only one can be selected, and this is the one with the highest utility. Production rule utilities are noisy, continuously varying quantities just like declarative activations and play a similar role in production selection as activations play in chunk selection. (p. 1044)

This concept has particular relevance for understanding the cognitive architecture of language production rules (or, "grammar"), as well as for designing instruction that assists in teaching students new ways of utilizing those rules. Consider how many writers use "rules-of-thumb" that do not necessarily coordinate to any formal rules for language (Berman, 1979).

Clearly, the volume of language rules that fill each individual's cognitive architecture is vast. The advantage of a CIP model like the ACT-R is the ability to see the connections between different modules, seeking to explain how each module functions on its own as well as within the larger network. However, such models are not the ones typically put forth by linguists; in those models, a full description of the rule set is the goal. Langacker (1991a) draws attention to the dichotomy between (what he calls) "connectionism," or "parallel data processing" (PDP) models, and traditional linguistic analytical models. His "cognitive grammar" positions itself as a middle ground:

At the descriptive level, cognitive grammar does posit rules and attempt to describe them explicitly. But in so doing it merely recognizes that a language comprises conventionally sanctioned irregularities...which speakers have to learn and which have some role in language processing. Crucial to assessing their cognitive status is the further claim that rules are nothing more than schematizations of expressions. (p. 535)

Cognitive grammar positions itself between the cognitive and traditional linguistic schools in its focus on grammatical rule structures as expressions of cognitive processes.

Much of the knowledge of language happens below conscious awareness, and it remains a difficult task to bring the rules to conscious inspection, regardless of their accuracy:

These rules are thus no more extensible to conscious inspection than the rules for keeping one's balance while riding a bike. We talk, and we keep our balance on bicycles, but in neither case did we know, at the level of consciousness, precisely what the guiding principles are. By way of analogy, the activity of the computer is directed by a program, but the program is not the object of the computer's activity; the computer carries

out calculations related to other things, not to the program that guides. (Langacker, 1973, p. 241)

For this reason, another significant contribution to language studies from cognitive information processing research is an understanding of how humans make certain rules automatic, thereby moving them to a different order of cognitive processing.

One particular theory of automatization that has been tested in a language-learning context was put forth by Logan (1988). This theory has three main assumptions. First, "encoding into memory is an obligatory, unavoidable consequence of attention," second, "retrieval from memory is an obligatory, unavoidable consequence of attention," and third, "each encounter with a stimulus is encoded, stored, and retrieved separately" (Logan, 1988, p. 493). Though the first two assumptions are commonly shared among other CIP theories of automatization, it is the third that makes Logan's theory particularly relevant to language learning contexts. The third assumption allows for rule modification to be a continually on-going process. When a rule (called an "algorithm" by Logan) reaches a definable threshold of instantiation of access, its structure changes, making it a memory-retrieved cue instead of a process-based algorithm.

Robinson (1997) tested Logan's theory using an experimental design with college-aged Japanese university students enrolled in an English as a Second Language (ESL) course. He tested under four different experimental

instructional conditions to test their learning of a particular grammatical rule. Each participant was given sixty sets of questions about the novel words following one of the rule conditions. Immediately following that was a transfer session, where each participant was given novel sentences but now asked to decide, as quickly as possible, whether the sentences were grammatical or not. Finally, the participants were asked if they had noticed any rules during the session, if they were looking for rules at all, or if they could say what the rules were.

Based on statistical analysis of the speed and accuracy of rule use, Robinson (1997) reports that “instructed learners are clearly superior to [normal] learners...in their ability to generalize the knowledge developed during training...and in their accuracy on new grammatical sentences” (p. 240). In addition, the instructed learners were better able to generalize and make fast, accurate decisions, implying that the rules had become more quickly automated into memory-retrieval cues rather than process-based algorithmic routines, which require more processing time. As well, across all four learning conditions, when the participants were exposed to the same sentences more than once, their speed and accuracy rose, fortifying the instantiation theory put forth by Logan (1988).

Cognitive information processing theories bring a ground-level context to the notion of higher-order language rules. As research continues to understand the larger architecture of human knowledge, especially the ways in which

language is acquired and changed by learners and the ways in which grammar rules are learned and manipulated, some necessary components of a cognitive approach to learning grammar become clear. First, the instruction must take into account the procedural knowledge base that the learner will need. Second, the instruction must make learners aware of their own internal language architecture because of its automated functioning. Third, the internal architectures must be compared to the desired goal language, in terms of its own internal schemas, in order for instruction to be effective.

From CIP, the need for example use in order to demonstrate the rule and to allow the user to practice the procedures will lighten the cognitive load required to “learn” the new procedure until it becomes automated. In the next section, these CIP theories are examined in terms of the rule-based approaches to language instruction that have been derived from them.

Rule-based approaches to language instruction.

Rule-based approaches are familiar in the sorts of exercises and instruction provided to elementary and secondary students. With drill-and-practice and sentence-generating exercises, the goal is to practice the rules repeatedly until they become automatic in their usage (DeKeyser, 1993). From an information-processing standpoint, the focus on the deductive mode of rule learning, including seeing both examples and non-examples, as well as having

the opportunity to rehearse as necessary, and receive feedback on that rehearsal, until the skill is mastered, follows principles of the adoption of procedural knowledge. With the clear links between language and procedural knowledge, an examination of the general principles of adopting procedural knowledge is in order.

As described by E. Gagne (1985), there are two main approaches to gaining procedural knowledge, largely depending upon what type of procedure is the focus of the instruction. In pattern-recognition procedures, learners gain “the ability to recognize and classify patterns of internal and external stimulation” (p. 103). In action-sequence procedures, learners gain “the ability to carry out sequences of operations on symbols” (p. 103). Though the two procedures often become intertwined in actual performance (as it is in actual grammar instruction), isolating them for learning can be beneficial. One way to do this is through the effective use of examples to aid in developing two necessary cognitive processes for both types of procedural learning, “generalizing” and “discriminating” (p. 106).

Providing well-chosen, abundant examples allows the learner to determine to which situation a given procedure applies. “If two examples are presented one right after the other and if these two examples differ widely on irrelevant attribute values, then the appropriate generalization is most likely to develop” (E. Gagne, 1985, p. 111). The learner can then improve discrimination skills by the incorporation of both examples and non-examples, in order to see

places where the rule fails, thereby reducing the set of possible procedures to which it will apply (E. Gagne, 1985). In either situation, time provided after the examples to allow the learner to have trial-and-error attempts at using the rule, along with frequent and appropriate feedback from the instructor, will aid the learner in acquiring procedural knowledge.

Once the knowledge becomes so complex that it requires mostly internal mental processing, mostly through the manipulations of different sorts of symbol systems such as mathematical or grammatical systems, it becomes an “intellectual skill” (R. M. Gagne, 1985). Intellectual skills involve learning to manipulate and comprehend symbols, and as the skill sets become more complex than basic associations, they begin to follow what R.M. Gagne (1985) then formally calls “rules”:

The most typical form of an intellectual skill...is called a rule. When learners have acquired a rule, they are able to exhibit behavior that is rule-governed. Such behavior does not mean that the learners are able to formulate or state the rule... Performance is rule-governed when its regularity can be described only by a rule statement rather than by the relation of a particular stimulus to a particular response. A rule statement relates classes of stimuli to classes of responses. (p. 51)

Instead of memorizing the verb forms for each possible verb, humans relate a pattern of information, such as the “class” past tense, to each case and generate a “class” of responses (for example, “add *-ed*”). It is important to note that, for R.M. Gagne as well as Langacker (1973), the learner may or may not be aware of this rule formulation, may or may not be able to state it. Awareness is irrelevant

to the learning. For R.M. Gagne, the performance of the rule will demonstrate its learning or not.

Rule statements fall into two general patterns, “concepts” or “discriminations” (R. M. Gagne, 1985, p. 53). Concepts are needed to generalize and organize the classes of stimuli and responses into meaningful categories. Discriminations are needed in order to create meaningful patterns of difference between symbols and procedures. These networks work together to create a meaningful rule for a procedure. As these networks continue to get more complex, they form even more general classes of stimuli and response and might be called more formally “higher-order rules” (R. M. Gagne, 1985, p. 54).

Higher-order rules, unlike a simple rule statement, allow for more generalizable patterns of concepts and discriminations and are used to solve problems by allowing the user to bring rules from very different situations together to solve a particular problem. This pattern is the level on which whole language operates. Single-rule statements, of which there would be too many for any one person to bring to conscious memory, are laid upon each other, borrowing rules from different domains (linguistics certainly, but also culture, gender, race, and other systems) and using them to create a new instance of language that solves a particular communicative problem at a given time.

R.M. Gagne (1985) suggests several conditions that can be set in place that will encourage the gaining of intellectual skills, and more specifically for the end-outcome of learning higher-order rule patterns. To begin with, there are certain

internal and external conditions that can provide for the best learning environment for gaining intellectual skills (R. M. Gagne, 1985), which are summarized in Table 1. From these conditions, it can be seen that clear statements of performance goals and creating an environment conducive to seeing how skills build upon one another are the central concerns for designing instruction to best teach rules, higher-order or not.

Table 1: Conditions for Learning Intellectual Skills

Location of conditions	Conditions for learning
Internal Processes	Being aware of prior knowledge, specifically which previously learned procedural knowledge might serve as a sub-procedure for the newly learned skill.
	Being aware of target procedures for learning that will assist in recalling prior knowledge or creating new procedures.
External Conditions	Clearly stating the desired performance outcomes.
	Offering verbal instructions that stimulates recall of necessary component skills for learning the rule.
	Offering a clear verbal description of the rule itself, including provision of many examples that allow the learner to both generalize and discriminate the necessary attributes of the rule.
	Offering a verbal prompt that encourages the demonstration of the rule, not necessarily the statement of it.
	Offering appropriate reinforcement when the appropriate performance is achieved to encourage repetition of the performance.

It is important to understand that R. M. Gagne's (1985) formulation of intellectual skills works in a hierarchical manner, relying on the proper formation of the lower-order patterns before higher-order learning can occur. In other words, if higher-order rules are to be learned in the most advantageous manner, first the sub-rules that come into play must be accessible and learned well. If those sub-rules are to be learned well, the discriminations and concepts that determine the rule must have been learned. For those discriminations and concepts to be understood, the basic associative chains must have been in place.

This strict hierarchical pattern of knowledge formulation allows for slow, step-by-step building of small skills into larger patterns until the end goal is achieved. At the college-level, when writing that essay, this method of instruction is difficult, slow, and impractical. The first-year student often times does not have access to or awareness of the multitude of discriminations and concepts that go into all of the processes involved in putting 2000 words or more together into a cohesive essay. R.M. Gagne (1985) does not provide a distinction between instructional strategies that are different for simple or higher-order rules, so it is assumed that he must believe that the same conditions of learning will apply to both, but with differing orders of complexity for learning task, practice environment, and example use.

A central instructional goal in rule-based learning strategies could be seen as being able to perform the rule using as few cognitive resources as possible. This process is called "automaticity" (Driscoll, 2005, p. 80). DeKeyser (1996)

describes automaticity as a type of cognitive “cost effectiveness” function, weighing the cost in terms of cognitive effort against the probability of correctly applying the procedure. For example, when driving a car, certain skills like turning the steering wheel left to move the car left have become automatic. This skill requires very little cognitive effort in order to achieve a very high probability of getting the correct response when desired. The sheer number of practice attempts with positive feedback (turn the wheel, the car turns) allowed that skill to move from the cognitive effort it required when first learning it to the automatic cognitive process that it is for proficient drivers.

However, compare that against the ability to spell words at a collegiate level. Most common words have been practiced so often that their spelling requires very little cognitive effort to recall. Spelling “the” can be said to be an automatic skill. But other words, because of their infrequencies or unusual orthography, have a lower probability of being spelled correctly unless a higher amount of mental energy is applied to the task. Spelling “onomatopoeia” is not an automatic skill. If a high probability of success is required, then energy will need to be spent (Fashola, et al., 1996).

Driscoll (2005) provides three further guidelines for designing instruction according to this rule-based information-processing model. These guidelines echo R. M. Gagne’s (1985) conditions for rule learning, though they also extend beyond to more general strategies. The first guideline according to Driscoll is to provide instruction that is organized in meaningful patterns. For example,

“graphic techniques [for organizing information presentation] (such as semantic maps, concept maps, networking) analyze, elaborate, and integrate subject matter content, as well as illustrate concept relations. The result is enhanced structural knowledge on the part of the learner” (p. 105). The second strategy is to arrange “extensive and variable” (p. 104) practice, which will aid in increasing the ability to discriminate or generalize rules, as well as working towards automaticity of rule usage. The third guideline provided by Driscoll is to increase the learner’s self-control over the information in order to increase the learner’s own ability to encode and retrieve appropriate production schemes. The learner’s self-control mechanisms have been collected under the term “metacognition,” and although it does play a role in rule-based learning, it plays a much larger role in process-based models of writing and will be discussed further in following sections.

Research on cognitive processes, in particular automaticity functions in second-language learning (DeKeyser, 1993, 1996), has demonstrated that automaticity is centrally important in language learning, and secondly, that “automaticity was to be achieved by over learning of stimulus reaction chains, grammar teaching followed by extensive drill and practice, and the careful sequencing of mechanical, meaningful, and communicative drills” (DeKeyser, 1996, p. 350). However, he also argues that, until recent theories such as Anderson et al’s (2004) ACT-R theory, the assumptions of automatic language learning were untestable.

DeKeyser (1996) demonstrated that, when learning a language, automaticity of rule patterns can be best achieved through examples and practice based around the production of the rule, not the comprehension of the rule. This thought echoes the sentiment of others who note the distinction between being able to perform, effortlessly and mostly flawlessly, and being able to describe the rules being enacted in any meaningful way (Bruner, 1996; R. M. Gagne, 1985; Langacker, 1973).

From the rule-based methodologies, it is clear that strategies of using abundant examples and encouraging practice to the point of effortless, flawless performance are valuable in learning rules. However, as noted above, most of these theories focus on such lower-order, systematic productions as to be virtually unusable in any but the most controlled of situations. For example, the techniques might serve well to automate the alphabetic learning that is required of basic language comprehension. However, as the rule base becomes more complex, the techniques might not function as well (Resnick & Resnick, 1991).

The push for focusing only on rules in their generalized, decontextualized, atomized forms works well when firm control over the environment and learner is available. Once that control is given over to real-world embedding of knowledge, different sorts of learning come into play and different strategies should be attempted (Bruner, 1996; Wildman, 2005). The next section reviews the research on schema theory and its use of the contextualization variables that CIP theories lack.

Schema Theories

Principles of schema theories

Schema theory has found particular relevance to the notion of language instruction, and it represents the second main theoretical influence on developing pedagogy of grammar for higher education. Armbruster (1986) defines schema as “prototypical or generic characterizations of objects, events, and situations” (p. 253). From this, two main primary types of schemas can be identified that impact learning: content and textual schemas. Content schemas organize knowledge of people, places, things, events, or situations. Textual schemas organize knowledge of discourse conventions, including both broad categories, such as paragraph and sentence structures, and highly-specialized categories, such as scientific or technical writing. Textual schema are process-oriented schema, evolving as the reader negotiates each new text. “According to a schema theory, therefore, meaning does not reside in the text alone, but is a product of the interaction of reader and text” (Armbruster, 1986, p. 254). This theory was very popular in writing instruction through the 1980s.

However, an example of the integration of CIP and writing theory is Flower and Hayes’ empirically-derived “Cognitive Process Theory of Writing” (1981). The key features of their schema-theory based model are “a set of distinctive thinking processes which writers orchestrate or organize during the act of composing” (p. 366).

By the end of the 1980s, as evidenced in Scardamalia and Bereiter's (1986) "Research on Written Composition" in the third edition of *The Handbook of Research on Teaching*, the research covered the (then) current theories on schema, acquisition, motivation, process theory, and propositional networks. Yet, the notion of grammar is almost totally elided, with any kind of technical or formal competence in language being relegated to the deficits of special needs learners or language-acquiring children. In fact, the only "grammar" mentioned in their nine "new focuses in research" is "story grammar" (Scardamalia & Bereiter, 1986, p. 802), which indicates the higher-level of focus that had become the primary focus of cognitive writing research.

The process-based writing methodologies of the 1980s and 1990s grew out of cognitive research, but focused not on the ground-level processes of the rule-based traditions but on the notion of a schema as a semantic, or meaningful network of connections for storing and retrieving knowledge from memory (Driscoll, 2005). The additional focus on the "higher" levels of cognitive processing through the development of meaningful schemas agreed well with the goals of teaching students to develop all of the fundamental language skills they have learned into the writing talents of fully-functioning citizens (Bereiter & Scardamalia, 1987).

Process-based approaches to language instruction.

Bereiter and Scardamalia (1987) used the term “intentional learning” (p. 9) to think about new models for writing pedagogy that will promote skills of “high literacy” (p. 9), even if the students have not come from high-literate environments. In their analysis, they suggest four main strategies to encourage students to shift to intentional learning modes, instead of being passively accepting of instruction. The first is the use of problem-solving strategies to encourage complex, creative, novel interactions between previously learned skills. Second is the use of strategies that will encourage the learner to self-regulate the achievement of learning outcomes. The third is the use of strategies that will encourage the learner to become aware of the executive decision strategies that guide the more complex choices they are making. Fourth, the use of strategies that will promote self-seeking of solutions and will encourage intentional, as opposed to passive, learning is the final strategy they suggest. By following these strategies, learners can be encouraged to engage with the goals of writing on their own terms, and regardless of prior experience, be guided to an understanding where they are capable of making higher-level decisions to solve more complex problems (Scardamalia & Bereiter, 1986).

As can be seen from these four suggestions, the strategies are largely not centered on writing knowledge, at least on any sort of declarative level, but instead focus on the higher-order processes of writing as sites for embedding that other knowledge. Resnick and Resnick (1991) call this shift in focus “the

thinking curriculum” (p. 41). From this, it can be seen that process-oriented approaches that focus on higher-level cognitive processes would not ignore the “base-level” knowledge of grammatical rules as described in the last section. On the other hand, neither would they keep a learner unaware of those mental processes for creating meaningful responses to writing prompts.

The various approaches that can be grouped under the name “process-based approaches” tend to focus on central sets of process-related skills. Flower and Hayes (1981) have developed one of the most thorough schemas for understanding the writing process, and many of the central processes involved in their theory involve the higher-order processes discussed by Bereiter and Scardamalia’s (1987) “intentional learning,” such as the central writing processes of planning, translating, and reviewing.

For example, Burkhalter (1997) compared three grammar instructional methods in terms of metacognitive strategies and effectiveness. Her research demonstrated how traditional grammar methods of drill-and-practice ultimately failed the learner because of cognitive overload in attempting to remember all of the rules taught on such an explicit level. She discussed how the sentence-combining trends of the early 1990s were a step in the right direction because of their ability to offer practice at embedding language rules in small, but complex, realistic structures.

In an example of employing student-centered techniques to improve language learning, Ching (2002) conducted a descriptive study, in which he

applied a treatment of teaching a group of college-level engineering students strategies for self-regulation of writing goals. He based this treatment on research that studied expert writers and found that they had a cognitive model that allowed them to regulate three main types of variables: personal, task, and strategy variables. Task variables are the ones most frequently taught, most likely because these are the most comfortable to instructors not formally trained in either cognitive psychology or instructional design. Ching (2002) focused his research on measuring the effect on student's overall ability to produce effective writing by teaching four specific strategy and self-regulatory techniques: self-evaluation, organizing and transforming, seeking information, and seeking social assistance.

Ching (2002) found that, overall, there were significant improvements in the students' abilities to evaluate their progress and overall writing quality. The students also showed marked improvements in self-efficacy and self-determination, though attribution scores did not significantly change because, generally, the students demonstrated good attribution abilities before the treatment anyway.

In one final example of process-oriented cognitive theories being applied to language instruction, Cullen (1996) used schema theory to teach advanced second-language learners grammatical rules associated with process-oriented language (e.g., doing things). A control group received syllabus-based instruction of learning outcomes for eight two-hour sessions following a

traditional model. A second group received the experimental condition of four two-hour sessions focusing only on the general schema for processes. They worked in a large group “refining, retuning, and restructuring their general schema for process” (Cullen, 1996, p. 9) in their native language, applying the schema to everyday activities until the schema was well-identified and accessible. Then they received four two-hour sessions covering the material on the syllabus given the same outcomes as the control group, but with half of the practice time. Both groups demonstrated a positive learning gain, but the experimental groups gained significantly more than the control group on the posttests. Cullen (1996) suggests that possibly the schema that they co-developed made the learning accessible in different contexts, thereby better storing it for long-term use.

Overall, it can be observed that process-based approaches to language instruction tend to focus on schemas of writing processes, on the learner’s self-awareness of those schemas, and on the processes of self-regulation (specifically, self-evaluation, organizing, seeking information, and seeking social assistance) necessary to enact the schemas properly. The advantages are that the learner’s active involvement in mapping these schemas shows demonstrated benefits in developing meaningful strategies for planning, translating, and reviewing. The disadvantage is that, without an emphasis on clear outcomes and time spent offering a wealth of examples, the student may improperly construct the schema, resulting in a failure of performance at some level in the chain. If the

instructional guidelines are carefully monitored, schema theory can be successfully employed in the classroom (Ching, 2002; Cullen, 1996). If not, schema may develop individual variations that can ultimately cause a failure in communication.

The next section covers situative approaches, which seek to extend the meaning-seeking, process-based approaches by focusing not only on the individual's ability to construct meaning but also on communal patterns of meaning-making (often defined by "experts" within the community), such as genre conventions and dialects.

Situated Learning Theories

Principles of situated learning theories

Situated cognition centers on the external influences on learning, on the differences between “knowing what” and “knowing how” (Brown, et al., 1989). That distinction is crucial when considering language rules because of the difference between knowing how to speak a language and being aware of the rules that underlie its formation (R. M. Gagne, 1985; Langacker, 1991b). In this section, the major elements of situated cognitive theories that have an impact on language learning will be reviewed.

Brown, et al. (1989) define some of the underlying principles of the situated cognition movement that have remained throughout its development. Central to the school of thinking is the notion that all knowledge is coproduced by a relationship between information and the situation in which it is encountered:

Recent investigations of learning...challenge the separating of what is learned from how it is learned and used. The activity in which knowledge is developed and deployed...is not separable from or ancillary to learning and cognition. Nor is it a neutral. Rather, it is an integral part of what is learned. Situations might be said to coproduce knowledge through activity...by ignoring the situated nature of cognition, education defeats its own goal of providing usable, robust knowledge. (p. 32)

This argument builds off of two primary claims. The first is that humans with their tools have developed standards of behavior that have ultimately formed “communities of practice,” (p. 34) which share common goals, protocols, and

meaning-structures. The second is that learning is fundamentally a process of being enculturated into communities of practice (Brown, et al., 1989; Lave, 1997). They suggest that authentic activities in the educational environment, especially those fostering collaborative learning, rich problem solving, and role-playing, will ultimately situate knowledge more usefully than in the current model of passing on outcome-based, decontextualized information and procedures.

Brown, et al. (1989) use language rules as primary examples in their article. Citing years of research on language acquisition, they note the significant difference between the rate of vocabulary usage between contextualized learning and traditional school learning. They note that the average seventeen-year-old student has been acquiring vocabulary at the average rate of 5000 words per year, simply based on exposure to the words in their environment. However, traditional school-based vocabulary instruction, the kind involving “tried and true” drill-and-practice methods, is often limited to at most 200 words per year in order to retain a high success rate (Brown, et al., 1989). It is clear that the primary way to learn new words is from their contextual, situated placement near other words with clearer meanings. However, the authors further strengthen the connection between language and situated knowledge construction:

All knowledge is, we believe, like language. Its constituent parts index the world and are so inextricably a product of the activity and situations in which they are produced. A concept, for example, will continue to evolve with each new location of use, because new situations, negotiations, and

activities inevitably recast it in a new, more densely textured form. So a concept, the meaning of a word, is always under construction. (p. 33)

If all knowledge is structured cognitively like a language, then certainly improving understanding of language rules should have agreeable benefits for other higher-order knowledge learning as well, according to situative theories.

As opposed to focusing on the inner processes and mechanisms involved in learning within an individual's cognitive architecture, situated cognition theories focus on the context for learning, on the situational variables that might contribute to one's ability to recall and use information with ease. Of course, these skills take into account fundamental cognitive processes, such as memory access, automaticity, and schema formation. They also include the external context for understanding environmental conditions that fundamentally restructure the way the information is coded into memory.

For learners, becoming aware of that context can be part of the challenge. Bruner (1996), attempting to reconcile the years of cognitive research with the current educational culture, discusses the difficulties for instructors to take into account their students' bodies of knowledge:

Our practices often presuppose knowledge that is plainly not accessible to us by means other than praxis. Most people have no "theory of grammar" despite speaking in well-formed sentences. It requires the mighty labor of linguistics to discover the "rules" of grammar...rules of grammar do not explain how people speak, nor "cause" them to speak in a certain way. (p. 105)

The identifiable "rules" of linguistics have often been the goal of language learning. Bruner points out that there is *always already* a context of praxis, or the

way learners speak and the rules they use that are already present before instruction occurs. Those two sets of rules (the ones students learn on their own and the ones taught to them in the educational institutions) are often incommensurate and not used to inform one another.

One way in which situated cognition theorists have taken this context into account is by studying experts in communities of practice. Norman (1993) defines two different modes of cognition, reflective and experiential, that experts use to solve problems. Experiential cognition is a fast, feasibly-automatic recall state, “driven by the patterns of information arriving at our senses, but dependent upon a large reservoir of experience” (p. 23). On the other hand, reflective cognition is a slow process, requiring concentration and sustained patterns of thought that allow for logical deductions, corrections in thinking, and attempts at creative solutions. Because of its sustained nature, reflective thought can be greatly aided by tools that allow thoughts to be stored, organized, and used to think.

A person requires both of these abilities, but too often, the educational system concentrates on creating environments to teach only experiential cognition, because of its apparent quickness and ease. As Norman (1993) puts it, “I would not want a pilot who had to reflect on what to do: I would want a pilot who was so well trained at the proper response it would come effortlessly, quickly. Experientially” (p. 17). Yet, in the emphasis on experiential cognition, and by developing tools to make thinking faster, more effortless, a fundamental

need for experts to demonstrate both abilities is ignored. Too often, educational models will demonstrate the experiential mode of cognition but not engage students. Norman (1993) defines new ways to conceive of technology to encourage more reflective modes, to develop better ways of balancing the skills required for each mode of cognition.

Situated cognitive theories seek to explain this balance by studying how “real-world” situations require information to be employed and disseminated among the members of a community of practice. (p.17)

The complexity of real-world problems causes higher-order rules, such as goal and priority procedures, to interact with the knowledge being learned. It is that process that ultimately encodes the information in contextually-meaningful ways. If school-like problem-sets can mirror real-world problems better, students have the potential to better transfer that learning to new and unpredictable sorts of problems in the future.

The desire to create real-world settings is often used in language and writing instruction, particularly in second-language environments (Nagata, 1997; Nagata & Swisher, 1995), but also in other college-writing classrooms. The movement beyond schema models was furthered by theories that desired to see writing skills being taught in the real-world contexts in which they would eventually be used (Bereiter & Scardamalia, 1987; Collins & Gentner, 1980; Hayes & Flower, 1980).

In applying real-world language environments to language instruction, Rohde and Plaut (1999) have put forth what they term a “stochastic” (p. 69)

model of language development, which sits in direct opposition to many of the prior “competence grammar” models. Traditional models assume a single, correct grammar, one toward which all students should be progressing with regular usage. Any deviation from that grammar is considered erroneous. However, their stochastic model assumes that “the grammars acquired by members of a language community need not be identical but only sufficiently similar to permit effective communication” (p. 70). Variations are explained by semantic intention and contexts that can range from linguistic (e.g., the typical subject-verb-object order of English sentences) to sociocultural (e.g., the choice of vocabulary to explain concepts). From this, observing student language becomes much more significant. The students’ specific variations from standard patterns need to be explained in order to teach a target, “standard” alternative.

In another study examining the contexts that affect language formation, Huspek (1986) studied a group of 10 white, male laborers from a large industrial city on the American Northwest coast using a combination ethnographic and statistical design. They averaged 29 years old, and most had at least a high school degree.

The analysis of the interviews led Huspek (1986) to develop seven rules that explain upwards of 98% of the variations in the speech patterns of the laborers. Huspek (1986) demonstrated that the choice of rules is clearly, and consciously, dictated by social/stylistic reasons, not simply a single response only to linguistic environment by each individual. His study may be limited to

this particular group and closely related groups, but it is generalizable in terms of creating a method for finer-grain analysis of linguistic events, one that incorporates contextual semantics into all grammatical constructions. The language events he described displayed clear power relations between speakers in almost every instance, and the variation in the choice between *fishin* and *fishin'*, for example, could be explained by the speaker and listener's power relations.

It is clear that situated theories take into account variables that intertwine internal and external variables. CIP theories discussed in prior sections take into account primarily internal cognitive states, though often using much of the same terminology and framework to do so. Though different in their primary areas of focus, cognitive information processing, schema development, and situated cognition describe the development of higher-order rule structures and language acquisition. The next section will place this understanding within a specific instructional context, the development of an online environment for grammar instruction.

Situative approaches to language instruction.

The theories described under the name "situated cognition" in many ways can be seen as extensions of, and complements to, the process-oriented theories described above. By extending the importance of meaningful schemas to good

learning, situative approaches focus on meanings that are socially determined by communities of practice (Bereiter, 1990), not simply focusing on the individual's efforts to create meaningful schemas but also looking for ways that communities play a significant role in schematic construction. They complement those theories, then, by providing a broader subject of focus in the examination of how people best learn.

Hyland (2003) noted how the process-oriented approaches to writing, which have held popularity in composition studies since the 1980s, are often directed toward inner processes, helping the individual writer understand their own individualized processes. However, he argued that this focus is not sufficient or desirable for second-language learners, who require more contextual learning. Hyland (2003) suggested that a genre-based pedagogy, or one based on socially-accepted patterns of text creation, would be more effective:

Genre is a socially informed theory of language offering an authoritative pedagogy grounded in research on texts and contexts, strongly committed to empowering students to participate effectively in target situations... There is nothing here that excludes the familiar tools of the process teacher's trade. Genre simply requires that they be used in the transparent, language-rich, and supportive contexts which will most effectively help students to mean. (p. 27)

Situative approaches, then, often do not ignore the wealth of research that shows the advantages of teaching such skills as mapping, planning, organizing and self-monitoring, but they add a focus on language-rich environments that lay bare the conventions of target communities of practice.

One of the central effects of this additional focus is a rethinking of what is represented by a “standard” language that is being taught to students. In traditional rule-based pedagogies, often the notion of a standard language was kept invisible and unquestioned in the instruction, and the effect has been to teach the classroom-based languages as “correct” language and any dialectical differences embodied by a student’s language as a deficit in ability that needed to be “corrected” (Christian, 1997). However, once the instruction lays bare the notion of a community-determined standard, one of the resulting changes is a re-enlivening of the value of a student’s home dialect. Acquiring a different community’s language does not necessarily invalidate one’s native practices (Christian, 1997).

In Christian’s (1997) review of the treatment of dialects in American schools, she examined classrooms that have successfully incorporated students’ native dialects into the instruction of a standard language. She offered four guidelines for teaching a standard dialect, given this shift in philosophical positioning.

First, instructors should take into account the importance of referencing relationships between social groups. In other words, students are often unable to negotiate the tricky social and political dimensions that separate different dialects. Typically, the “standard” language is representative of the group in central power and other dialects are in different power relations to that central group. This makes it easy to adopt standard patterns if one is a member of the

community in power, but varying levels of difficulty are to be had if one is not. Christian (1997) suggests that instructors have a responsibility to make themselves aware of these issues so they can better assist language learners to negotiate those differences without devaluing the language-base from which they originate.

The second guideline is to provide specific information about the dialectical issues that are present in the specific classroom in question. Brice (2004) provided an example of an instructional design where the student and teachers work together to improve student writing (in this case, the students all had specific language-learning disabilities). Her hypothesis was that teaching the students language “fundamentals” would improve their abilities to identify and manage their own disabilities. These fundamentals were phonology, morphology, semantics, syntax, and pragmatics, a list that covers everything from the basic associative procedures (phonology) to the social contexts in which language will be used (pragmatics). This allowed the learner to draw from prior experiences and personal understandings to see the differences between their speech and the target language. Christian’s (1997) third suggestion broadens that guideline to encourage more systematic research into dialectical differences and how best to incorporate that into instructional design.

The final suggestion is to reexamine the notion of “standard English.” Christian (1997) suggests that the standard that is taught should reflect the language norms of a local community, not some distant standard that does not

apply to the student's direct experience. This suggestion should be qualified to understand that her target audience was primary and secondary language education, and her primary concern seemed to be the phonological standards of English rather than syntactical or semantic differences. To that extent, it may be valuable for beginning language learners to lay the groundwork for understanding these networks of social and political relationships, but that network would need to be broadened in a context of higher-education, where the communities are no longer just local, but are a mixture of local, national, and global communities. Ching's (2002) study is a good example, where the students were engineers who were being asked to develop discipline-specific understandings of language schemas based on national and international community standards.

In addition to reframing schema theory to be more culturally-situated, situative instructional research also borrows heavily on the notion of self-directed learning. For example, Murray and Kouritzin (1997) call for an "autonomous-learning" (p. 186) mode with four central characteristics: an emphasis on active learning and exploration to accomplish desired goals; direct and varied contact with the target language; use of a wide variety of authentic language materials so that choice for the learner becomes central to the activities; and learner management as central instructor function, enabling students to determine their own pace and decisions based on "personal need, learning style, and interest" (p. 191). In these characteristics, one can see the foundations of the

situative approach, including reliance on authentic activities and a rich, real-world environment in which to work.

These types of environments can be demanding of the instructor, requiring the teacher to renew afresh her understandings of her class' needs each time the group changes. In prior, rule- and process-based approaches working with decontextualized notions of human cognition, this was not an issue. However, in situative approaches, the instructor needs to become more centrally aware of their students' cognitive model. As Schulz (2001) notes,

Language learning could thus be hindered if students have specific beliefs regarding the role of grammar and corrective feedback and if their expectations are not met. It is up to the teacher to examine his or her students' perceptions regarding those factors they presume to enhance classroom language learning and to make certain that either student perceptions or instructional practices are modified to avoid conflicts between the two. If teacher behaviors do not mesh with student expectations, learner motivation and a teacher's credibility may be diminished. (p. 256)

Schulz (2001) realized this conclusion after an extensive survey of over 1,500 foreign-language students and teachers in the United States and Columbia that compared attitudes toward grammar in language instruction. In her survey, she noted that, while faculty expectations for grammar were high in both locations, distinct differences existed between expectations of the Columbian students and American students. The Columbian students preferred an increased focus on form in their instruction and the American students preferred focus on function. As American universities gain a more diverse population, it will be important that instructors become aware of the way the content of their discipline situates

itself in relation to the student, in order to maximize each student's potential to breach the gap between their personal and the university's communities.

In summary, the situative approach to language instruction involves many of the same basic instructional strategies as the process-based approaches, including focus on schema theory and cognitive processes, such as planning, reviewing, and generating. In addition to those focuses, a cultural context is placed before the learner, specifically one representative of the target community to which the learner is becoming a member. In the specific case of language instruction, those target communities are a "standard" language, in the case of general writing/composition courses, or discipline-specific languages, in the case of discipline-based (e.g., engineering or psychology) writing courses. The autonomy of the learner, as in process-based models, remains central, but as opposed to the focus on the individual from process-based instruction, the learner's autonomy is placed again with the communal context: the instructor's goal is to bridge a gap between the learner's personal language and the target community's language. This allows the learner to approach the gap between personal and communal knowledge without devaluing the personal and by gaining the communal.

Computer-based instruction as context for online language learning

This section provides an overview of the research into computer-assisted language learning in order to demonstrate its effectiveness for language learning. In general, research has indicated that the design of quality online writing instruction is particularly needed, given the overwhelming presence of textual media that makes up the online interface to begin with (Peterson, 2001). Online language learning can easily provide a large number of varied examples to an audience on-demand. The online environment can be useful in instructing the learner in self-regulation techniques, an important facet of schema-based theories (Brandl, 1995). They also are an easy place to find examples of real world writing, a central principle of situative theories (Campbell, 1998).

This section seeks to define the key attributes of an online language learning environment and how these attributes might contribute to the learning of language rules.

The central position of writing in online environments

One main consideration for online grammar instruction is an extension of the first. As the online environment becomes more of a real-world site for learning and transmitting knowledge, recognition of writing and improvement of writing skills becomes essential in having those online interfaces function well.

Peterson (2001) noted the importance of revising the goals for writing instruction within online environments:

First of all, because the primary interface of a distance-learning course is the written word, writing teachers' expertise will be increasingly needed as courses are written and delivered in online environments. Second, the only course universally required at almost all colleges and universities is the first-year writing course. (p. 359)

Peterson (2001) defined three central issues to revising a writing instructor's approach to online writing instruction. The first is a revision of the teacher's role to be more decentered, which invites the learners to co-construct knowledge alongside the writing teacher. As a second step, a reform of the political underpinnings of the classroom interactions "encourage[s] diverse voices by 'creating a space for more diversity in higher education'" (Peterson, 2001, p. 361). The third suggestion is to revise the student's access to information by allowing them more choices in their approach to learning and providing more and greater varieties of feedback using technologies that "offer new ways of gathering information from the students" (Peterson, 2001, p. 367). By capitalizing on the capabilities of the technology, the students can be provided with a student-centered environment, guided by an informed instructor.

Designing computer-based environments to enhance self-regulation

Good design principles can be used to create online environments specifically geared at enhancing students' cognitive abilities. Brandl (1995), for instance, studied the advantages of being able to provide various methods

feedback through a computer interface, ranging from providing examples to providing the correct answer to both high- and low-achieving students. He demonstrated the effect of feedback on the student's ability to engage in productive cognitive processes and the student's ability to stay motivated to learn the material.

In another example, Liu and Reed (1995) designed a *Hypercard*-based environment to teach vocabulary to second-language learners. They adapted several scenes from the movie *Citizen Kane* to have the students both learn explicit vocabulary words and to have them enact that vocabulary in critical-thinking exercises about the movie. Testing their environment against a control group receiving normal classroom-based techniques, their findings were significant. The vocabulary words were learned and retained significantly better with the hypermedia environment. In addition, computer anxiety was reduced and computer attitudes were raised through the experience. Finally, the findings showed no significant differences in achievement between different learning styles (of the field dependent/mixed/independent variety), most likely because the hypermedia environment provided the types of support (either directive or holistic) that the different kinds of learning styles require, all at the discretionary use of the learner to control by accessing the functions of the designed environment.

Lowe and Bickel (1993) also compared two identical writing courses, one using traditional face-to-face techniques and one incorporating technology into

75% of the course material, with computer-based grammar and mechanical exercises and word processing. They found statistically significant differences in the post-test achievement measures, even with controls such as pretest scores, semester, age, sex, commuting distance (the only even slightly significant factor), prior computer experience, employment status, and marital and family status. However, as is often a limitation in quasi-experimental designs using in-tact classes as participants, the power of the study was low, with only 27 students from which to draw their findings. Taken with the other research described, however, clearly it can be demonstrated that computer-assisted language learning (CALL) can offer learners more choices and more control over those choices, as well as keeping them more motivated and less anxious about writing processes, all thereby enhancing the self-regulatory techniques described in the literature (Ching, 2002; Graham & Harris, 1997; Zimmerman & Risemberg, 1997a, 1997b).

Real-world online environments

Another reason to use online environments for language instruction is because of the real-world nature of the World Wide Web (WWW). Utilizing such a real-world context works well to satisfy the requirements of situated cognitive learning theories. Campbell (1998) provided an example of using the WWW for grammar instruction in second-language learning (native English speakers

learning German, in her case). She described allowing students to find examples of grammatical structures and to analyze real-world writing for grammatical aptitude, correctness, and creativity in structure. The experience provided a needed cultural context for grammatical learning, and it allowed the students more opportunities to practice a wider variety of rules, integrating the rules into meaningful patterns more quickly. In addition, the practice of asking students to identify language structures provides a type of cognitive apprenticeship by demonstrating the behaviors of the target community of practice. She did warn, however, that this should not be the sole form of language instruction because of the over-abundance of examples that are not carefully controlled and may contain ambiguous, unpredictable, and erroneous variations (Campbell, 1998).

Extension of human cognitive capabilities through technology

Another consideration for developing an online environment for language instruction extends from the notion of capitalizing on the technology. More than simply capitalizing on the technology as an information-gathering device, the technology we have developed enhances and extends human cognitive abilities. If online environments are essentially communicative environments, as suggested by Petersen (2001), then those environments should assist humans in laying bare the processes of communication, fundamentally built upon the

higher-order organization of grammatical rules, from syntactic up to social-semantic patterns.

Norman (1993) notes that “technology...is essential for the growth of human knowledge and mental capabilities” (p. 5), even calling writing a “mental artifact” (p. 79) that has allowed for great extension of human capabilities. For Norman (1993), the central technological issue is one of “perceived affordances,” or what abilities or functions a person thinks an artifact can provide (p. 106). Most of us only pay attention to the affordances that we already know about, often not searching for the functionalities and abilities that aren’t as obvious. As he noted,

It should come as no surprise that those things that the affordances make easy are apt to get done, those that the affordances make difficult are not apt to get done. (p. 106)

If reading and writing are means of interacting with one form of artifact (language), and online-based instructional environments are another means of interaction, both of these offer affordances that can extend our ability to communicate. Becoming aware of these affordances, as well as their limitations, can further our understanding of how they function together. Smart designers, Norman notes, will pay attention to “salient perceived affordances” (p. 106) that, in turn, lead the learner to pay attention only to the functions that they need and leading them to ignore others that are not brought into saliency. As shown in the

study by Campbell (1998), using the WWW can help to raise the saliency of instructional points about grammatical usage in real-world contexts.

Of course, Clark's (1983) now-famous statement that the content and the delivery medium can be separated, and that good instructional design can teach the same content in any context provided a good argument against the need for using an online context for grammatical learning. Kozma's (1991) response, however, was highly relevant to this third consideration for online grammar pedagogy. He noted that "Ultimately, our ability to take advantage of the power of emerging technologies will depend on the creativity of designers, their ability to exploit the capabilities of the media, and our understanding of the relationship between those capabilities and learning" (p. 206). This seems to be the challenge that online writing instructors are facing, increasing the capabilities of communication, both by instruction of grammar and the use of technology.

Designing computer-assisted language learning (CALL) environments

If instructional design is to be of use in designing computer-assisted language learning, it would be best served to pay careful attention to the cognitive and situative contexts of language use. Of course, computers cannot present the same sort of language environment and "are not particularly good at spontaneous, intuitive, warm, human, flexible, genuinely communicative two-way spoken interaction" (McCarthy, 1994, p. 2). However, McCarthy (1994)

presented seven distinct advantages that computer-based language learning offers if designed with careful design principles in mind.

If designed carefully and with respect to the psychological theories guiding the functioning of the grammar instruction, CALL has been shown to be effective. One specific example is the body of research represented by Nagata (Nagata, 1997, 1998; Nagata & Swisher, 1995), who has shown the effectiveness of using computer-based feedback methods to enhance the metacognitive strategies of second-language learners.

Savenye, Olina, and Niemczyk (2001) directly discussed the need for systematic instructional design issues to be applied thoughtfully to online writing instruction. They suggest beginning by analyzing the context, learners, and goals for the writing instruction. Then, when developing the materials for an online course, instructors need to be aware of the most recent research, to stay open minded in their incorporation of new techniques, and to be aware that their role shifts from information-holder to community-guide. Resource issues play a very significant, often unstated, role in the instruction. Who will provide technical support? Who will create the materials for online distribution? How will it be maintained and updated? Those sorts of questions can make a big difference in the successful implementation of online writing instruction.

In addition, Savenye, Olina, and Niemczyk (2001) suggested that the materials created for the courses should be well-organized and presented in meaningful patterns, which will ultimately enhance the schematic adoption of

the language. High-quality materials, designed with cognitive principles of memory-load, aid the students in accessing the material in a successful way. They also suggested the use of the communication tools of technology to enhance both peer-to-peer and student-to-teacher interaction.

Following most trustworthy instructional design models, Savenye, Olina, and Niemczyk (2001) suggested the development of assessments that can adequately monitor student progress, both quantitatively and qualitatively, with as much detail as possible about the acquisition of the target structures. Formative evaluations should be an integral part of the design from its first iteration in order to keep the course's material as relevant to the students as possible, given the inevitable cultural shifts that occur in the student body over time.

As computer technology is applied in ever-increasing ways to help students guide their own learning (Carlson, 2004; Carnevale, 2005; Read, 2005), we need to carefully design instructional environments to ensure the learner is correctly forming the necessary schema for good language skills. The next section synthesizes the various approaches to language learning that could form the basis of a suitable online instructional environment.

Synthesis: Balancing Skill Acquisition and Social Context

The previous sections demonstrated how rule-based, process-based, and context-based theories can be applied to writing instruction. Each of the identified traditions, because of their chosen foci, has advantages and disadvantages, summarized in Table 2. This research seeks to capitalize on the advantages, while mediating the disadvantages, of these three theories in order to propose a learning environment conducive for learning grammar rules in a higher-educational context.

In instructional terms, competency in grammar suggests an ability in a wide variety of skills, ranging from ability to create verb tenses to understanding the role of audience in decisions about the number of acceptable clauses in a sentence (Bereiter & Scardamalia, 1987). Writing is a higher-order rule system, and learners should benefit from instruction derived from instructional theories geared towards these higher-order systems (Flower & Hayes, 1981).

Grammar, however, is traditionally thought of as a “lower-order” system within the larger writing knowledge-set (Hayes & Flower, 1980), and grammar instruction is traditionally built around the ways learners best handle these lower-order rule systems (Burley, 2001). Practitioners of writing know that there is a gap between “knowing” a grammar rule and using that rule to build creative, thoughtful prose (Baron, 2002; Berman, 1979).

Table 2: Comparison of Three Cognitive Design Theories

Instructional Theory	Instructional Design Principles	Advantages	Disadvantages
Cognitive Rule-based learning	using abundant examples and nonexamples encouraging practice encouraging automaticity	focus on performance as criterion for success practice allows for embedding rules to point of automaticity	emphasis on decontextualized rules forces loss of practical context practice of skills requires large time investment
Cognitive Process-based learning	focusing on learner's internal schema for successful writing teaching mapping and concept-formation techniques to learner teaching self-regulatory techniques	focus on meaningful construction of schemas makes learning relevant for the learner focus on processes of writing encourages focus on activity rather than content, production rather than understanding	focus on higher-order issues may cause an improper encoding of the required lower-order rules, resulting in a corresponding failure to develop the higher-order skills properly focus on student's internal cognitive processes may not fit real-world applications that the knowledge requires
Situative Context-based learning	focusing on community practices as target outcomes for instruction focusing on student's current schema/knowledge in relation to target practices focusing on autonomy of learner and self-construction of knowledge	focus on meaning extended to a relevant social context, making it applicable to a broader base of students focus on community practices gives real-world experience to the learner focus on complex problems allows learner to see examples that are embedded in context	focus on higher-order issues of community conventions may take time away from the lower-order skills that are fundamental requirements of the higher-order processes requires a broad understanding of the social contexts of each student, implying a big, ongoing responsibility by the instructor

Research on the cognitive dimensions of language has shown that grammar is a higher-order rule system in and of itself (Langacker, 1991b). The grammar of a language contains layers of rule systems to assist speakers in creating infinite meaning out of limited set of symbols (Langacker, 1991a). This research seeks to design instruction that balances between the higher-order and lower-order rule pedagogies. The three main theories were chosen for the developmental framework because of their potential to contribute significantly to instruction that achieves that balance.

A stable theory of pedagogical grammar (Berman, 1979) is still a developing concept, bridging work in cognitive, situative, and linguistic research. In this final synthesis, three instructional elements that would be central parts of a theory for online grammar instruction will be highlighted.

The first instructional element would be to encourage the cognitive connections that form basic associations required to create rules. These environments must be rich in examples and non-examples (R. M. Gagne, 1985). They must also offer opportunity to practice the associations and the performance of the rules in question and to be given appropriate feedback so that the rule may be moved from conscious processing into automaticity (DeKeyser, 1996).

The second instructional element would encourage appropriate and meaningful construction of an individual's grammatical schema. Higher-order processes of writing, such as organizing, transforming, and reviewing (Flower &

Hayes, 1981), typically did not pay much attention to the processes of grammar except as a sub-process of reviewing. These concepts can be applied to grammar instruction in order to encourage higher-order thinking about the sentence-level activities that form the foundations of these higher-order rule systems (Connors, 2000; Myers, 2003; Pinker, 1998). This will encourage a guided overlaying of grammar rules one upon another, forming an appropriate and meaningful grammatical schema (Connors, 2000; DeKeyser, 1996; Flower & Hayes, 1981; R. M. Gagne, 1985; Myers, 2003; Pinker, 1998).

The third design element should encourage awareness of external social contexts that contribute to grammatical knowledge, awareness of dialectical and disciplinary differences should be central to the design of the instruction. This task poses a particular challenge to the instructional designer, as those differences shift in each new linguistic community. Though some elements remain consistent, such as the subject-verb-object functions of English syntax, many shift depending on the community of practice in question, such as the preference for the use (or avoidance) of the passive voice.

The three elements described here form the basis of an instructional environment that allows the learner to encode the base level rules and to practice with them at their discretion; encourages the learner to understand the overall grammatical/linguistic schema while learning these base-level rules, and places this learning within a personal and professional learning context.

Chapter 2: Methodology

Operationalizing the theory

In this chapter, a developmental study is proposed that will operationalize the theoretical framework described in Chapter 1 into design elements for a specific instructional product. The final goal is the development of an Internet-based instructional environment for teaching a pedagogic grammar (Berman, 1979) based on a blending of cognitive rule-based, cognitive process-based, and situated context-based theories. This instruction would be integrated, primarily, into writing courses in higher education environments. However, the instructional environment could be easily incorporated into any course, at the instructor's discretion.

In order to describe the development of a prototype for the purposes of this dissertation, this section summarizes the instructional principles, as derived from the three main theories in Chapter 1. For each of the three main theories identified in the literature review, a table is presented describing the eight proposed design elements, alongside the instructional principles grounding the elements and a rationale for the design choices.

The first two proposed design elements are derived from the cognitive rule-based theories of CIP (See Table 3). Design Element 1, which will be referred to as "Example Use," describes an instructional environment embedded

Table 3: Design Elements: Cognitive Rule-Based Theories

Design Element	Description	Instructional Principle	Rationale
1. Example Use	Instructional environment richly embedded with examples and nonexamples of "grammar in action"	Using abundant examples and nonexamples (R. M. Gagne, 1985)	Examples provide evidence of rules enacted (R. M. Gagne, 1985) Non-examples provide meaningful variations from the rule (R. M. Gagne, 1985)
2. Infinite Practice	Practice environment set-up for "infinite" practice with parallel examples and non-examples, encourages practice at the learner's control	Encouraging practice (E. Gagne, 1985) and automaticity (DeKeyser, 1993, 1996)	Focus on performance as criterion for success (R. M. Gagne, 1985) Practice allows for embedding rules to point of automaticity (DeKeyser, 1993, 1996)

with many examples and non-examples, and to be most effective these examples will be examples from real-world writing situations. R.M Gagne (1985) described the benefits of this for learning production-based higher-order rules by offering many opportunities to see the rule enacted, and the rule broken, in order to encode the appropriate cases for later retrieval. Placing the instruction into an Internet-accessible format allows the learner to view these examples and non-examples as many times as is necessary for the learner to feel comfortable with the concept. Then, in conjunction with Design Element 2, which will be referred to as "Infinite Practice," the user can practice as much as is needed with the concept to verify that understanding.

Element 2: Infinite Practice calls for creating an instructional environment that allows the learner to practice with the rule as much as possible. Giving the learner control of the frequency and depth of practice is critical to encouraging the rule to become an automatic part of the learner's cognitive schema (DeKeyser, 1996). This was accomplished by placing the instruction into an online, Internet-accessible set of Webpages, making the practice environment available 24-hours a day, 7-days a week to the learner, who can then choose to practice as needed with each given concept. The instructional environment is described in more detail as follows.

Though the particularities of the grammatical content of the instruction is not a focus of this research, Design Elements 3-5 (see Table 4) begin to outline the aspects of the content that have been derived from the literature review. The process-based design elements are derived from cognitive schema theories (Armbruster, 1986; Ching, 2002; Cullen, 1996; Zimmerman & Risemberg, 1997a, 1997b). For example, Design Element 3, which will be referred to as "Internal Schema," calls for part of the instruction to focus on the learner's internal set of grammar rules. It will include a set of choices for different learner's first-language or dialect of American English. Allowing the user self-identify the grammatical structures that, cognitively-speaking, he/she learned first, will allow the learner's internal schema for grammatical knowledge to become relevant to the "standard English" instruction.

Table 4: Design Elements: Cognitive Process-Based Theories

Design Element	Description	Instructional Principle	Rationale
3. Internal Schema	User-defined system will identify first-language/dialect for each user in order to identify learner's internal schema and use that to present additional instruction	Focusing on learner's internal schema for successful language learning (Cullen, 1996; Fashola, et al., 1996; Fogel & Ehri, 2000; Ravn & Gelman, 1984)	Focus on meaningful construction of schemas makes learning relevant for the learner (Armbruster, 1986; Cullen, 1996)
4. Content Schema	Instruction focuses on grammar rules with a focus on linguistically-functional concepts that can be used for high-level sentence writing	Teaching mapping and concept-formation techniques to the learner (Armbruster, 1986)	Focus on processes of writing encourages focus on activity rather than content, production rather than understanding (Cullen, 1996)
5. Self-regulation	Online environment and practice environment encourages student's self-regulation of learning outcomes	Teaching self-regulatory techniques, such as self-evaluation, organizing and transforming information, and seeking information and social assistance when needed (Ching, 2002; Graham & Harris, 1997; Zimmerman & Risemberg, 1997a, 1997b)	Self-regulatory techniques improve learner's ability to adopt the target learning outcomes in an individually-meaningful manner (Zimmerman & Risemberg, 1997a, 1997b)

Design Element 4, called “Content Schema,” comes the closest to the content-level of the instruction, calling for instruction to be presented in terms of the overall concepts and interrelations of the content being instructed. This will be presented not solely as a list of rules but also as a set of complex, interrelated rules forming a higher-order system of symbols that control meaning. Taking advantage of the affordances of online instruction, map, or schema, of the grammatical rules they are to learn. In addition, the instructional language frequently is able to cross-reference, and actually provide a hyper-link to, other lessons within the instruction, allowing the learner to take time to form their own schema for the knowledge.

Design Element 5, referred to as “Self-regulation,” encourages learners to take time to form an individual sense of learning outcomes and form a plan to work towards those learning outcomes, a technique called “self-regulation” (Ching, 2002; Zimmerman & Risemberg, 1997a). The online environment is, again, particularly suited to this task, allowing the learner a clear “site map” and navigation tools for visual mapping cues, enough time for learners to internalize that schema at their own individual paces, and availability at the learner’s discretion.

The final set of design elements were derived from the context-based situated cognitive theories (See Table 5). The central principle of these design elements is to provide the learner with a significant learning context to help place the grammatical schema described in the last section into a meaningful context

for each learner. Design Element 6, referred to here as “External Schema,” provides for the learner to select a specific community of practice to determine the schema for an external context, in this case a particular professional field such as Engineering or Business, in which they are attempting to gain competency in that field’s variations of grammar rules. This supplemental instruction balances a learner’s internal schema (Design Element 3) and the content schema (Design Element 4) with a particular discipline’s practices.

Table 5: Design Elements: Cognitive Context-Based Theories

Design Element	Description	Instructional Principle	Rationale
6. External Schema	user-defined system will identify context for each user in order to identify user’s intended or existing community of practice	focusing on community practices as target outcomes for instruction (Brown, et al., 1989; Lave, 1997)	focus on meaning extended to a relevant social context, making it applicable to a broader base of students (Brewster & Klump, 2004; Ching, 2002; Myers, 2003)
7. Situated Learning	supplemental instruction will bring student’s current schema in line with the target practices	focusing on student’s current schema/knowledge in relation to target practices (Fogel & Ehri, 2000)	focus on complex problems allows learner to see examples that are embedded in context (Lave, 1997)
8. Functional Participation	the user-defined environment facilitates the learner to discover the grammar needed knowledge to become a functional participant in a chosen community of practice	focusing on autonomy of learner and self-construction of knowledge (Murray & Kouritzin, 1997)	focus on community practices gives real-world experience to the learner (Lave, 1997)

Design Element 7, called “Situated Learning,” continues this notion by focusing the supplemental instruction on successfully learning to vary the standard rules in order to be in line with current standards of practice in a given community (Fogel & Ehri, 2000). Along with the examples being used from these various disciplines, Situated Learning allows the learner to approach the complex, higher-order rules of grammar in practice in a self-directed manner.

Design Element 8, which will be referred to as “Functional Participation,” posits an environment that encourages the learner to take on the learning of grammar as a process of self-discovery and self-construction. Though the design elements are not in a particular sequential order, the concept of Functional Participation puts all of the previous elements into action. It encourages the learner to decide a pace for needing practice and time reading over the instruction. It asks the reader to consider the range of grammatical knowledge, customizing the experience for each learner by combining the grammatical schema from the learner’s internal schema for language rules, a standard American English grammatical schema, and a professional variant of that set of rules. This completes the cycle of bringing the individual learner’s personal grammar schema in line with standard practices (Element 3: Internal Schema) and then also putting those standard practices into perspective according to a given convention in a professional field (Element 6: External Schema).

In total, these eight design elements represent the basis for an instructional environment that will blend the advantages from the three

theoretical frameworks described in the literature review (see Table 2) and operationalize them into a prototype for delivery. The next sections describe the specific steps that will be taken to enact these design elements. These steps will detail the prototypical development of the environment and can be summarized as follows. First, there is a need for *development of instruction* that can serve to enhance a student's ability to create effective sentences in his or her future field of employment. Second, beyond the actual instructional content, there will be *development of an instructional schema* that capitalizes on the user-defined affordances of technology to meet the educational needs of the learner. Third, in order to be able to customize the experience for individual learners, there needs to be *development of a delivery system* that capitalizes on the archival and dynamic affordances of technology to customize the educational and research environment for a scalable, virtually universal audience.

Development of Instruction

The first step was to develop content for instruction that would serve to enhance a student's ability to create effective sentences in his or her future field of employment. There are three central characteristics to this instructional content that will be detailed in this section. First, the instruction must contain many examples and non-examples (R. M. Gagne, 1985), derived from a real-world context in order to make them meaningful to the user (Brown, et al., 1989;

Lave, 1997) (see Example Use, Table 3). Second, the instruction must offer opportunities for limitless practice to encourage automaticity of the rule-learning (DeKeyser, 1993, 1996) (see Infinite Practice, Table 3). Third, the instruction must offer as much control as possible to the learner in order to encourage self-construction of the knowledge (Armbruster, 1986; Ching, 2002; Graham & Harris, 1997; Murray & Kouritzin, 1997; Zimmerman & Risemberg, 1997a, 1997b) (see Element 5: Self-regulation, Table 4).

Figure 1 outlines the proposed instructional sequence. This sequence consists of three small units, each with three sets of outcomes to accomplish. The arrows indicate the suggested, linear path for the instructional sequence. This path begins with the first outcome, providing instruction centered on examples and non-examples that embody the rule. It then offers links to a set of practice questions on that same concept. This practice page in turn leads back to the second outcome, and so on through the nine learning outcomes. In a traditional environment (a classroom or textbook, for instance), this sequence would be the only choice.

However, by taking advantage of an Internet-based environment, this instruction will be able to be delivered in both a linear and non-linear fashion, based on the user's need. Through the use of clear navigational interfaces and location indicators, a typical instructional page would indicate to the user the next linear step, as well as allowing the user to jump to any other point in the

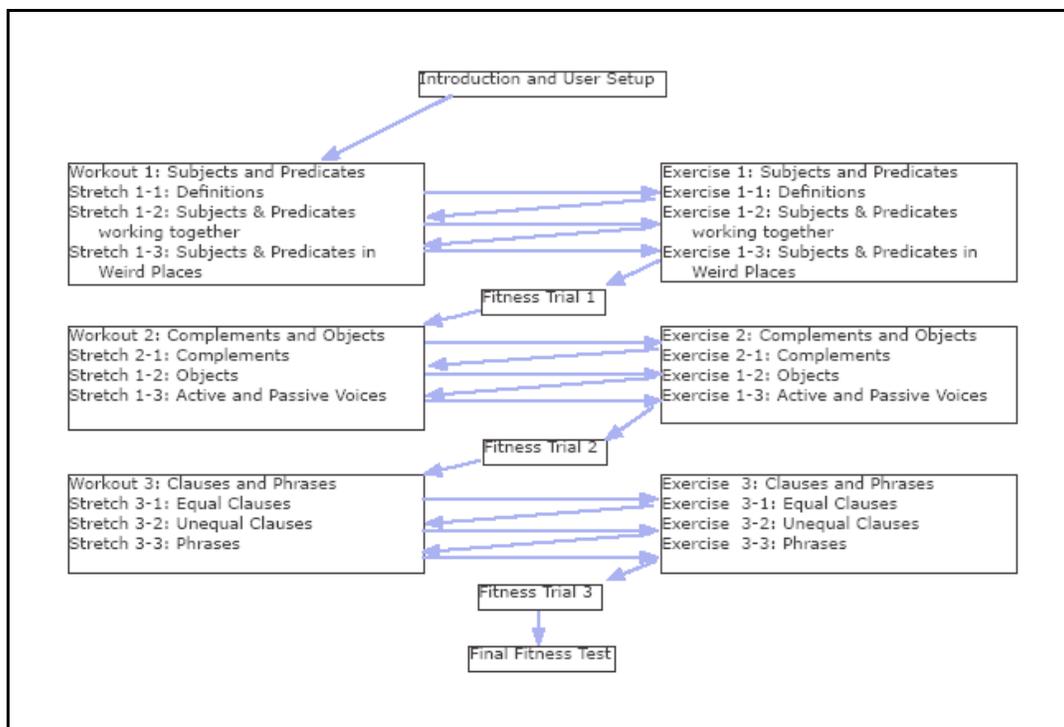


Figure 1: Instructional Content Sequence Schematic

instruction or practice environment easily. In that way, a user can choose to focus only on the practice environment, to return to an earlier step of instruction, or to follow the linear path step-by-step. By creating an instructional sequence within an Internet-based system, the proposed design will meet all three of the necessary characteristics.

First, examples and non-examples will be provided on each instructional page, and these examples can easily be drawn from a wealth of “real-world” sources. Because the instructional content is the grammar of sentence construction, sentences can be drawn from the newspaper, from research reports, from virtually all types of professional-level writing in a variety of disciplines. Second, the practice environment will be accessible at any time and as many

times as needed by the user to accomplish the learning task, encouraging automaticity of each proposed rule. Third, the user will have total control over navigating through the system, encouraging self-regulation of the learning objectives.

Development of an Instructional Schema

The second step of development is the designing of an instructional schema that capitalizes on the user-defined affordances of technology to meet the educational needs of the learner. This was achieved by creating a database-driven, dynamic Internet-based website as the delivery environment for the instruction described above. Not only will this environment offer the potential for a linear and non-linear sequence of instruction as described above, but also, by being database-driven, it will allow the users to customize the presentation of the information in two specific ways. First, the users will be able to define their native language or dialect of American English. Second, the users will be able to define a professional field of choice, or “community of practice,” a term derived from the situated cognition research (Brown, et al., 1989; Lave, 1997). Based on these two user-defined variables, customized supplementary instruction will be presented on appropriate instructional pages. This supplementary instruction will specify variations of rules from the “standard” instructional rule being presented on a given page.

For example, imagine User A defines herself as a native Chinese speaker who is studying Psychology. User B defines himself as an American from Appalachia who is studying the Humanities. A particular page of instruction has, for example, the objective of teaching how to transform passive to active verb tenses and vice versa. The main area of instruction will present the standard rule with both examples and non-examples of the transformation. This will be the same for both users. User A will see, in addition, the particular variations of the rule that Chinese speakers often misunderstand (activated by her choice of the first-language variable) and a description of why sometimes Psychology, as a discipline, prefers passive sentence structures (activated by her choice of discipline). On the other hand, User B will see a description of the most frequent errors Appalachian speakers make in constructing active and passive sentences (activated by his choice of the first-language variable), as well as a description of the preference of the Humanities to speak always in the active voice (activated by his choice of discipline). In both cases, the users receive instruction that provides instruction in “standard” grammar rules, but supplemented with relevant, significant information about grammar used in the user’s primary dialect and in the user’s intended external context.

In terms of scope, it is clear that the prototype developed for this study cannot offer an extensive range of variable choices for all first languages and professional communities of practice. In order to exhibit the methodology for operationalizing the theoretical elements, which is the primary focus of the

dissertation, a prototype will be developed to provide an understanding of the theoretical potential of a more fully-developed system. This prototype will provide enough learner-defined variability to demonstrate the proposed instructional schema described in this section to the subjects participating in the formative evaluations.

Development of a Delivery System

The third step in the process is the development of a system able to deliver the instruction and to enact the proposed instructional schema described above. This section describes the proposed dynamic, scalable computer architecture that will deliver the instruction to the learner. The intent is to develop an environment driven by an interactive, database-generated set of Webpages. This design architecture will allow for the user-customization described in the first and second steps.

The database will be hosted on an Oracle system, and written in MySQL tables. Figure 2 represents the data architecture of the database. This table structure will allow for dynamic content to be displayed through a PHP-constructed Webpage that displays blocks of HTML code drawn from the database depending on the instructional sequence and user preferences. Specifically, the Page table contains the layout of each page, consisting of references for one or more entries from the content blocks, depending upon the

individual user's selected preferences. Each user can create an "account," where they set a username and password and choose a internal and external schema

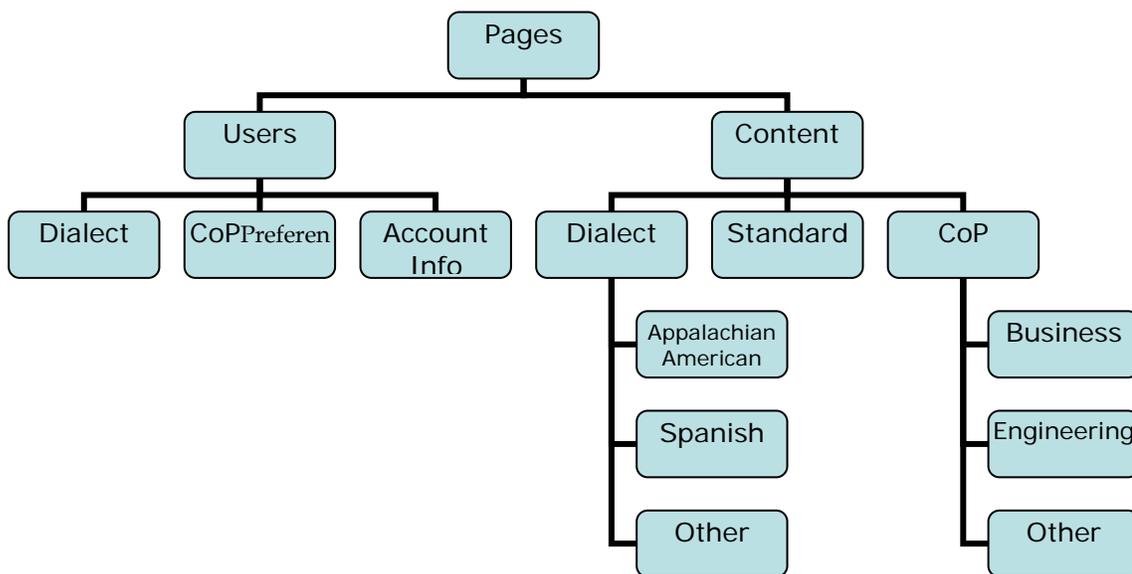


Figure 2: Database Architecture for the Database-driven Webpage Instruction.

The content blocks consist of three types: standard blocks, dialect blocks, and Community-of-Practice (CoP) blocks. All blocks consist of "snippets" of HTML code that can be inserted into the PHP script in combination to display the contents of any given page in the instructional environment. Each page consists of one standard block, at the bare minimum. The standard block might be standard instructional content, a page to explain navigation, or just the basic homepage. Dialect blocks are blocks of supplemental instruction.

For the development of the prototype, two main dialects were chosen to demonstrate the design principle, so users may choose from three choices:

Appalachian American English, Spanish, or Other. The two dialects were chosen because of availability and variety of documentation on the differences between them and standard American grammar. The information in these blocks is displayed on pages where the supplemental instruction is appropriate, depending on the user's choice of dialect variable. CoP blocks are also blocks of supplemental instruction, and similar to the dialect blocks, their appearance is controlled on certain pages by user-choice.

For the purposes of developing a testable prototype, two main CoP types were chosen because of the availability and variety of documentation from which to draw specific differences between standard English grammar and these communities' practices. The two CoPs used were Engineering Writing and Business Writing.

Based on the contents of the database, a Webpage is created by means of a PHP script that associates user-preferences and page-variables to construct each page as the user accesses it. For example, when a user accesses Page 52, the PHP script goes to the database and retrieves the page content, filtered by content appropriate to the user's defined preferences. The resulting HTML to be displayed in the user's browser might contain, for one user, a standard block of instruction on passive voice construction, a block of instruction on Spanish forms of passive voice, and a block of instruction on appropriate uses of passive voice in Business contexts. For a different user, the same page might display the same standard lesson on passive voice, but offer supplementary instruction on

Appalachian forms of passive voice, and examples of passive voice improvement in Engineering writing.

The advantage of developing a database to drive this instruction is its dynamic capabilities to adapt to user-selected variables, as well as to allow for ease of future development. With no change to the outward Webpages for some users, entirely new dialect and CoP preferences could be created and supplemental information added (see Chapter 4 for a discussion of future work).

Sample Instructional Screen

This section contains a sample instructional screen and a description of the functional areas of the instructional interface. Figure 3 is a sample screen that a learner might see while accessing the instruction. This section details how the sample screen satisfies the eight design requirements summarized in Tables 3-5. In this particular screenshot, the user is an Engineering student whose first language is Spanish (the user had previously chosen these variables when creating her account, and has now logged in to the system). The following narrative describes what this user experiences.

Section A is a navigational table available at all times to the user. This allows the user to decide which piece of instruction to receive at any given time, and it allows the user to choose how much practice and how much instruction to receive (Element 2: Infinite Practice). This aids the user in identifying the

> Home > Instructional Overview > Workout 1 > Stretch 1A > Subjects [Login \(new user?\)](#)

Subjects

B. Location Information

We can consider the **SUBJECT** of a sentence to be the "Actor" of the sentence. This word or group of words constitutes everything that we know about "who did the action" of a sentence.

Simple subjects:

A simple subject is the single word that is the main actor of the sentence. Most typically, this word will be either a NOUN or a PRONOUN. There are cases where VERBS are changed into NOUNS in order to be used as the subject, but those are still verbs working as nouns (those words are called "gerunds").

C. User Information & Links

Dr. Jenkins won her first Nobel Peace Prize at age 28.

Napoleon had set his sights on Russia's Empire.

The three red-faced, rambunctious children ran rampantly in the reading room.

Teaching at any level is a rewarding and engaging career.

Full subjects:

A full subject is the full group of words that contains the actor of the sentence, as well as any descriptors or articles that belong to that actor. These collections of words can be made up of single-word adjectives or adjectival phrases (see [Workout 3: Clauses and Phrases](#)). And don't forget those articles (the, a, an) -- those are special kinds of adjectives!

Dr. Jenkins won her first Nobel Peace Prize at age 28.

A short, determined man, Napoleon had set his sights on Russia's Empire.

The three red-faced, rambunctious children ran rampantly in the reading room.

Teaching at any level is a rewarding and engaging career.

Remember, if asked to identify the subject, that most formally refers to all of the words that describe the actor of the sentence; if the question is asking for the "simple subject," then that will typically be only 1 word.

That about covers the "actor" of our sentence, now for some "action"!

[Click here to learn more about Predicates.](#)

Spanish

*Omission of the subject is a very common and understandable mistake that speakers of Spanish make when studying English. Just keep in mind that, unlike Spanish, a subject is **always** necessary in English.*

*Students often write(or say): "Is important to talk to the teacher." whereas they should write: "It is important to talk to the teacher." The word **it** may not refer to anything in particular, but it is absolutely necessary to make this sentence grammatically correct.*

Engineering

This is an excerpt from the IEEE Standards Style Manual:

13.3 Gender-Neutral language

In order to reflect the changing practices in language usage, the IEEE Standards Activities Department uses, in as many cases as possible, generic titles (such as chair rather than chairman) in the body of the standard. The following practices shall apply:

a) When writing in the third person, the phrase "he or she" should be used. The male or female pronoun alone or the variations "he/she" or "s/he" should not be used. Also, the pronoun "they" should not be used as a singular pronoun.

b) If a particular sentence becomes cumbersome when "he or she" is used, the sentence should be rewritten in the plural or completely rewritten to avoid using pronouns. The indefinite pronoun "one" should be avoided. In references to a company, the pronoun "it," not "we" or "they," should be used.

These is important information that can affect the construction of many subject positions in your sentences.

E. User-customized Instructional Content, in this case, for Spanish and Engineering tips.

D. Main Instructional Content, which would be the same for all users

A. Linked Navigation Map

C. User Information & Links

B. Location Information

A. Linked Navigation Map

D. Main Instructional Content, which would be the same for all users

E. User-customized Instructional Content, in this case, for Spanish and Engineering tips.

How to Use the Gym
Instructional Pages
Exercises, Trials, and Tests
Contact Us

Figure 3: Sample Instructional Content Screen

learning objectives of the system, as well as setting personal goals towards achieving the objectives (Element 5: Self-regulation). For instance, this user could spend five to ten minutes on this page learning the information, then jump to the next page of instruction. Alternatively, after just a minute or two looking at this instruction, the user could easily jump to the practice environment and then back to the same instructional page if the practice did not go well.

Section B aids the learner by providing clear and predictable location information. This allows the learner to know which topic they are studying, and whether they are in a practice or instructional area. In addition, the predictable architecture of the instructional environment encourages the learner to develop the instructional schema being put forth in the instructional content (Element 5: Self-regulation).

Section C is where users can configure their personal account information, such as setting their internal and external context variables, as well as email contact and password information functions. This is the area that represents the user's control over the learning environment, allowing each user to customize the instruction to meet his or her internal schema, as well as a target community's schema (Element 3: Internal Schema and Element 6: External Schema). The information in this area determines the content that appears in Section E. In Figure 3, the user set the account to display supplementary instruction for Spanish and Business.

Section D is the main instructional area. As the sample demonstrates, this area is full of examples and non-examples, satisfying two different instructional principles (Element 1: Example Use and Element 2: Infinite Practice). This instruction is the standard instruction that all users receive, and it contains content-level knowledge, written in such a way as to understand the grammatical concept within the higher-order processes (e.g. essay writing) (Element 4: Content Schema).

Section E is the supplementary instructional area. The content of this area will be dynamic, created by the database, and determined by the user's settings in Section C. In this example, the supplementary information instructs the user that this rule is particularly important to understand in the target professional context, especially if strong, complex sentences are to be written (Element 8: Functional Participation). In addition, it provides examples, in the first language, of a specific rule variation between the standard language rule and the user's native language rule (Element 7: Situated Learning).

Evaluation Methodology

While the previous sections in this chapter describe the design methodology for a prototype of the instructional environment, this section describes the two primary evaluation methods used to determine whether the instructional environment meets the eight prescribed design elements. As

described above, this research seeks to examine how grammar can best be taught to students in higher education, culminating in the development of a prototype for an online instructional environment.

In the general instructional design process, an formative evaluative stage is typically identified to improve the performance and design of an instructional system (Hannafin, Hannafin, Land, & Oliver, 1997; Richey, Klein, & Nelson, 2004; Tessmer, 1993). A formative evaluation is “the systematic tryout of instruction for purposes of revising it” (Tessmer, 1993, p. 8). The formative evaluation in this developmental research is designed to investigate the capabilities of an instructional prototype constructed using the eight design elements (see Tables 3-5). It will provide valuable feedback with the goal of improving the prototype’s final design.

In order to get feedback from significant perspectives, two methods of formative evaluation will be incorporated into the design: expert review and small group reviews. These two methods were undertaken according to the methods described by Tessmer (1993), who suggested choosing formative evaluation methods based on several factors, especially “recruit[ing] subjects that can best provide the information” (p. 42) needed to get a good idea of what learners will experience with the instruction in its final form.

Subject-Matter Expert Review

Expert review was chosen as the first method because experts provide an “intrinsic evaluation of the instruction, meaning that the instruction is evaluated in terms of intrinsic merits such as content accuracy or technical quality” (Tessmer, 1993, p. 47). In this case, subject-matter and instructional design experts were asked to evaluate the system based on their particular expertise with one or more of the design elements involved in the study.

For the expert review study, a panel of five experts was identified: a researcher in instructional design and technology, a director of a university writing center, an instructor of technical writing courses, an instructor of business writing courses, and a professor of Appalachian language and culture. This population was chosen for their expertise in various disciplines applicable to the instruction. The instructional environment included several "layers" of instruction that were specific to disciplinary rules and variations of English (Element 3: Internal Schema and Element 6: External Schema). Experts who would understand the theoretical impact of these design elements on instruction were asked to review and comment upon the environment.

Experts in this study were asked to work in the self-paced, online instructional environment at their own time, and following their own pace through the instruction. Each expert reviewed the same instruction, but focused on an aspect of that instruction specific to her/his particular discipline. Before beginning the review, the experts were asked to review a statement that

explained the procedures (see Appendix A). While reviewing the pages of instruction, the expert filled out online surveys to provide feedback about particular pages (see Appendix A). At the completion of the review, there was a final online survey that provided overall feedback from the expert reviewer (see Appendix A). Each expert was asked to spend between one and three hours reviewing the instruction, to be done online at the expert's discretion.

Small-Group User Review

The second method of formative evaluation chosen was a small-group study, using a small group of volunteer students. This method was chosen because, as opposed to the expert reviewers, the student group in this case can explore the extrinsic factors involved in the more realistic deployment of the instruction to students as will happen in the final stages of product development, such as navigation, time for completion, ease and understanding of content (Tessmer, 1993). Similar to the expert reviewers, but different from “real-world” students, the students involved in the small-group user review should be aware of the design elements and are asked to give guided feedback about issues of interest to the research (Tessmer, 1993).

Three sections of writing students, 60 students in all, in Junior-level professional (business and technical) writing courses were given the opportunity to volunteer for the study. Twenty-three students responded and participated

fully in the small group study. The students were offered extra credit worth a replaced assignment grade in the course, thanks to the cooperation of the instructor of the three sections. Students were asked to use the instructional interface and to give feedback about the instructional design, instructional relevance and usefulness, and navigation. The students were given instructions to access the self-paced, online instructional environment, and were asked to document their time, effort, and satisfaction with the instruction (see Appendix B). Online surveys provided the mechanism for collection of student evaluation data (see Appendix B).

Upon agreeing to participate in the study, the students accessed the online instructional interface and created an account. They were then directed via online instructions to use the environment as needed to learn the concepts. They viewed instructions, exercises, and took a test to self-assess whether they had learned the material. In order to complete the instruction and receive extra credit in their sponsoring course, the students were required to complete a final, overall evaluation survey and complete the final assessment with an 85% accuracy, at which point their instructor received a notice that the student "passed" the instruction. In addition, there were optional feedback surveys available on each page of the instructional environment, and the students were asked to use these whenever they saw a design feature that they liked or that they wished could be improved.

The total amount of time each student spent in the environment was variable, depending on student engagement with the environment. The online availability of this instruction allowed it to be completed at the student's discretion, in time allotments also at the student's deciding. The students were given a time limit of one month in which to complete overall instructional goals.

The next chapter presents the results of these two formative evaluation studies, and Chapter Four follows with a discussion of the results, correlated to the eight proposed design elements outlined in this chapter.

Chapter 3: Results

Subject-Matter Expert Review

For the subject-matter expert review, five experts in various disciplines related to the instruction reviewed the prototype. All were given the same set of basic instructions about how to create an account, find the instruction, access the exercises and tests, and set user variables. Experts in the supplemental instruction areas were also supplied with a list of page codes for pages containing material related to their particular discipline (for example, the technical writing instructor was provided with a list of all pages containing supplemental content about the Engineering variable). While reviewing each page, the experts were given access to a “page-level survey” so they could comment on issues they saw, either positive or negative, as they reviewed the pages. In addition, all experts were asked to complete a final, reflective survey.

Overall, the five experts submitted forty-four evaluations for various pages within the environment. Table 6 summarizes the results of the quantitative questions from the page-level survey. Not all questions show $n=44$ because not all questions were appropriate for the user to enter a response to a page, so some questions would remain unanswered on each entry. It should be noted at this time that, although means are presented on Table 6, the researcher recognizes that the number of responses is very small. The means, therefore, are used to demonstrate a general trend in attitude from the experts instead. In fact,

the standard deviation is also a significant indicator of the degree of agreement between the experts on a particular issue.

Table 6: Quantitative Results of Expert Page-Level Surveys

Question	n	M&SD
1. On a scale of 1 (very useful) to 5 (not useful), how useful do you find the examples on this page?	25	2.6+/-1.3
2. On a scale of 1 (correct #) to 5 (too few), how would you rate the quantity of examples on the page?	21	2.8+/-1.1
3. On a scale of 1 (very relevant) to 5 (not relevant), how relevant to professional/academic writing were the examples on the page?	24	2.3+/-1.0
4. The instruction on the page encourages the student to practice with the concept. (1=completely agree;5=completely disagree)	20	2.7+/-0.9
5. The instruction on the page focuses on grammatical rules that would be helpful in forming high-level sentences. (1=completely agree;5=completely disagree)	22	2.4+/-1.1
6. The instruction on the page helps the learner to organize and work towards clear learning goals. (1=completely agree;5=completely disagree)	21	2.5+/-1.2
7. The instruction on the page helps to situate the rule within professional-use contexts. (1=completely agree;5=completely disagree)	21	3.1+/-1.3
8. The instruction on the page helps the learner to distinguish between their own internal rules and the standard and professional variations of the rules. (1=completely agree;5=completely disagree)	24	2.8+/-1.2

Because averages and deviations cannot provide a very accurate picture with only five experts and forty-four responses, it is important to focus on the words that the reviewers used to describe their experiences. Table 7 summarizes the main issues from the qualitative questions from the page-level surveys, listed by main design element commented upon.

Table 7: Qualitative Summary of Expert Page-Level Surveys

Design Element	Comment Summary
Example Usage	<ul style="list-style-type: none"> • The more real-world examples were cited as more effective. • Make color usage more consistent for parts of speech. • All relevant examples should be discussed locally, not provided solely as a link.
Navigation	<ul style="list-style-type: none"> • Offer an overall map for users • Make breadcrumb terms more consistent • Define navigational terms – “workout,” “stretch,” etc. – more clearly/easily
Dialect / CoP Content Blocks	<ul style="list-style-type: none"> • In general, there were positive comments about the importance of these blocks. • However, each expert questioned the specific content or language of at least one of the dialect or CoP content blocks. Most comments were concerns about the way the native speakers might interpret the examples as offensive or derogatory.

The qualitative results give a more detailed picture regarding expert perceptions of the prototype. First, the experts were able to point out many inconsistencies and typographical errors on the pages. In terms of example use, several experts either noted the usefulness of a real-world example (e.g., a sentence such as “A short, determined man, Napoleon had set his sights on Russia's Empire.”) on a page or noted the dislike of a non-real-world example (e.g., a sentence such as “The leopard-skin clad guy with the moustache lifted 350 pounds, which was the heaviest weight ever lifted by a man 3'10" tall.”). In addition, there was more than one comment about the color-coding that was used on some pages to code each part of speech with a particular color, but not

on others. The coding was suggested as a good idea, if it were consistent. One expert warned of accessibility concerns with color-coding. Finally, several of the examples used in the dialect and CoP content blocks linked to external material located on expert websites. Several times, experts commented that they would like to see more discussion of the concept and the development of local examples noting that students would not likely follow these links and do the “extra” work.

In terms of navigation, one expert recommended the need for an overall instructional map, perhaps offering a visual reference point to users as they proceed through the instruction. Another expert commented on the need for the breadcrumb navigation to be more consistent and useful. In addition, the terms that organized the instruction were not clear all the time to two experts, and they wished to have a clearer method of understanding where they were in the instructional hierarchy.

The comments about the dialect and professional content blocks were a balance of positive and negative comments. The positive feedback praised certain content blocks. For example, one expert noted “I really liked the way you pointed out that this particular usage ‘keeps an extra layer of meaning ... lost in standard english.’ Such a statement recognizes the intelligence and utility of Appalachian dialectical or spoken patterns! It shows that there is a reason and a good one, a sophisticated one, behind the usage.” The negative feedback warned of the careful monitoring of the examples used in the dialect or professional boxes, to ensure that the audience’s background and interests were taken

seriously, such as this comment (ironically, on the same content block, but by a different expert):

One substantial issue is setting forth the notion that these "Appalachian" usages are somehow widespread in the culture and therefore unanimously and consistently used....what I am saying is that it's probably best to say "sometimes," "on some occasions," "among certain people," or "in certain instances" instead of setting forth a usage as consistent or universal.

Many comments were a mix of positive and negative comments, such as this one on a business-writing content block:

I think the Paramedic Writing concept is essential for Business Writing... For a BW student to get the most use out of this idea, I'd like to see: (1) an in-text definition of Paramedic Writing, (2) a quick overview of what is done..., and (3) an original example. I think it's cool to offer the link to Purdue[’s website], and you ought to leave it, but I've found that if a student has to go somewhere else to do or read something, they simply won't. If you could add 1, 2 & 3, you'd make it more directly useful.

In addition to the page-level surveys, all experts were asked to complete a final, reflective survey that was aligned to the eight design requirements from Tables 3-5. There were five different qualitative questions asked, in order to draw out several patterns of commentary from the experts. Quantitatively, the overall quality of the instruction received a satisfactory rating. The usefulness of the examples was rated positively also. The ease of using the navigation received the lowest rating. The ability for a student to identify and work toward learning goals was rated in Questions 7 & 8, and both received relatively mid-level ratings. The exercises were rated as helpful. The dialect and CoP supplementary information were described as good elements of the instruction.

However, both areas also received average ratings on whether this environment encouraged the learner to recognize the difference between the dialect or CoP and standard English grammar. The experts did seem to believe that the dialectical and CoP information was presented fairly well.

Given the limited numbers of responses on the quantitative portion of the surveys, the qualitative results for the overall survey provided more detailed information about the environment (see Table 8). When asked to discuss the use of examples in the instruction, three patterns became clear in the feedback. First, examples need to be as relevant to real-world writing as possible. Second, though the practice environment does have useful examples, it could improve in drawing connections between the specific grammar rule and higher-level sentence writing skills. Third, it is imperative to remember that all examples, especially real-world examples talking about a person's native language or dialect, are socially and politically charged. Some examples caused uncomfortable feelings in some experts, though no one example seemed to cause all experts discomfort. It was suggested to read all examples carefully for potential inappropriate characterization of groups of speakers.

Table 8: Qualitative Summary of Expert Overall Surveys

Question	Summary
5. Comment on the examples	<ul style="list-style-type: none"> • Examples need to be as relevant to real-world writing examples as possible. • Practice environment does relate to example use, but could be improved by connecting more overtly to sentence writing skills. • Real-world examples are embedded within social and political contexts, and though they will be more effective, they have the potential of offending users if not written carefully.
10. Comment on navigation and learning goals	<ul style="list-style-type: none"> • Be more consistent with navigation. • Students will most likely not take time to form learning goals but proceed straight to final assessment and work backwards. • One expert found overall learning goals too simplistic for college-level audience.
17. Comment on the dialect content blocks	<ul style="list-style-type: none"> • The instruction in the dialect boxes was generally found to be useful and a good addition. • When information presented in dialect box and standard box conflict, be sure to clarify the difference more explicitly.
18. Comment on CoP content blocks	<ul style="list-style-type: none"> • The CoP content was generally found to be useful and a good addition. • Most experts noted specifically benefits to a student's ability to become more aware of the differences between standard grammar and disciplinary practices.
19. Other comments	<ul style="list-style-type: none"> • Both experts that made supplementary comments noted the need for improved testing, especially the need for a pre-test to help identify learning goals for the student.

When asked to comment on the navigation and the ability for learners to identify and work towards learning goals, some experts noted inconsistencies in the navigation that could be improved. One expert noted that students will most

likely not take time to form learning goals, but will instead proceed straight to the final assessment and then return to the instruction only if needed. One expert found the learning goals to be generally set too low for a college-level audience.

Comments on the dialect blocks were generally positive. One expert put it this way: “A student’s home language provides a great link to understanding how standard language works in different or similar ways, so I think trying to make those connections is a very exciting way to personalize this sort of set up.” However, it was also noted that when differences between standard and a dialect’s preference for a grammatical structure are noted, it is important to clarify the stance of the grammar gym – when to adopt the standard and when to adopt the dialectical pattern, or what the sociopolitical issues surrounding the grammar might be.

Comments on the CoP content blocks were even more positive than those for the dialectical boxes. One expert noted that “making the professional concentration boxes connect with the kind of writing the student ultimately wants to do successfully is a great idea. I can see how it makes the instruction much more valuable and relevant to their needs.” There was one suggestion that more of the resources that were linked in the content blocks should be related locally using different examples. The link for supplementary information can still be presented, but it would be optional.

In the space given for any additional comments, two notable comments were made. In the first, the expert noted, “As someone who is extremely skeptical about grammar instruction which is taught in isolation I have been not exactly sold on the whole grammar gym concept, to say the least. But I think that relating the instruction to any home language issues and also to their area of study is a great step in the right direction.” This expert went on to recommend a pretest to assist in a student identifying his/her own weaknesses and to encourage a more effective “skipping” through the material, which she believes all students would do anyway. Another expert also noted the need for more “rewards” for students at key points, perhaps with more saved information displayed after each exercise and practice test taken and passed.

Overall, the subject-matter expert review study revealed some important issues that will affect most content in the instruction, as well as smaller, more specific suggestion that will help to redesign the pages in useful ways. The expert seemed to suggest that the instruction was, broadly, effective and useful, which will be discussed more in Chapter 4.

Small-Group User Review

The second level of formative evaluation was a small-group user review consisting of twenty-three student volunteers representing a sample of students sharing similarities to the eventual target audience. The students were identified

through college-level writing courses, with extra credit being offered to participate in the pilot study. The students were asked to use the instruction as a “normal” student would, with the key difference of becoming aware of choices they made as they went through the instruction, kept a log of time that it took to complete the gym activities, and filled out surveys about their experience during and after the instruction.

During the instruction, students were able to fill out page-level surveys to give immediate feedback about specific pages that they were viewing at the time. This was a small-group study, with only twelve page-level responses. As such, these quantitative means and deviations were not indicative of any significant findings. Instead, as with the expert reviews, they were meant to indicate patterns and trends in student attitudes towards significant design issues.

As these results show, out of 23 students not many page-level surveys were completed. Overall, students did seem to indicate that they understood the concepts on the pages, and that the examples were useful. However, the students did tend to find the instruction too simple and that little practice is needed. In general, the students did not indicate, at least on the page-level surveys, that the dialect and CoP content was relevant to the particular grammar they have been reviewing.

There was only one qualitative question on the page-level surveys for the students. A majority of the comments in these boxes were of the mechanical / typographical nature, depicting issues that could be quickly resolved

(misspellings on pages, broken links in the text, etc.). The comments that appeared more than once were references to the helpfulness of the color coding of examples and the need for clearer login information to help students know when they are logged in and what variable choices are loaded.

After the students felt that they had reviewed the instruction enough and were ready to attempt the final assessment, they were asked to complete a final, overall survey before being given the link for the final assessment. This survey was more detailed than the page-level survey and elicited more detailed evaluation data. The quantitative results are summarized in Table 8. With only 23 respondents, the means and deviations are not highly significant quantitative findings. They are presented only as indications of general student attitude.

Quantitatively, the students rated the quality of the instruction as valuable. Examples were rated as satisfactory in terms of number, usefulness, and relevancy. The ease of navigation was rated lowest. However, students still noted that they were able to identify learning goals and move toward them. Students spent an average of 2.8 hours on the instruction, and they felt that the amount of time they spent on both the instruction and the practice was worth it. Student responses suggest that understanding variations in grammatical patterns between standard American English and internal rule set or an intended external professional community was useful for helping them learn the concepts.

Table 9: Quantitative Results from Student Overall Surveys

Question	n	M & SD
1. On a scale of 1 (not valuable) to 5 (very valuable), how would you rate the quality of the instruction?	23	3.9+/-0.9
2. On a scale of 1 (too many) to 5 (too few), how would you rate the quantity of examples on the instructional pages?	23	3.0+/-0.5
3. On a scale of 1 (not useful) to 5 (absolutely vital), how would you rate the usefulness of examples on the instructional pages?	23	3.7+/-0.8
4. On a scale of 1 (not relevant) to 5 (absolutely needed), how would you rate the relevancy of examples on the instructional pages to your overall learning?	23	3.5+/-0.8
6. On a scale of 1 (difficult) to 5 (easy), how did you find the navigation in the site?	23	2.7+/-1.1
7. On a scale of 1 (very difficult) to 5 (very easy), how easy was it for you to understand how to use both the instructional and exercise environments to identify learning goals and move towards them?	23	3.5+/-1.0
8. How many hours did you spend on the instruction? (In hours, for example "4.25" would represent 4 hours, 15 minutes. Please round to the nearest quarter-hour.)	23	2.8+/-1.3
9. On a scale of 1 (not worth it) to 5 (very worth it), in your opinion, how worth the investment of time was this instruction?	23	3.3+/-1.0
10. On a scale of 1 (not helpful) to 5 (very helpful), how helpful was the practice (exercises and fitness trials) to understanding the instruction?	23	4.0+/-1.0
12. On a scale of 1 (very valuable) to 5, in general, how useful is understanding one's own dialectic/first language grammar to understanding standard English patterns?	23	3.7+/-1.1
13. On a scale of 1 (not useful) to 5 (absolutely needed), in general, how useful is understanding the variations from one's professional writing protocols to understanding standard English patterns?	23	3.7+/-0.9
14. On a scale of 1 (not useful) to 5 (absolutely needed), how much did this instructional environment encourage you to understand your own dialectic/first language grammar in order to understand the differences between that dialect/first language and Standard English grammar?	23	2.8+/-1.2
15. On a scale of 1 (not encouraged) to 5 (very encouraged), how much did this instructional environment encourage you to understand your own professional writing protocols in order to understand the differences between that professional standard and Standard English grammar?	22	3.3+/-1.0
16. On a scale of 1 (not well) to 5 (very well), in general, how well was the information in the first-language boxes presented?	23	3.5+/-0.7
17. On a scale of 1 (not well) to 5 (very well), in general, how well was the information in the professional-concentration boxes presented?	22	3.5+/-0.7

The instructional environment encouraged understanding of these differences between internal and external schema. The students also noted that they felt the information in the supplemental content areas was presented well.

In terms of qualitative feedback, Table 10 summarizes the feedback that student users presented on four target design issues and one general comment question. In terms of example usage, two main issues were identified by students. First, the examples did help the students when they were practicing and taking the assessment. Some students indicated that there were too many examples, while others appreciated the high numbers of examples (for example, "I thought the examples were great- they were short and numerous"). Second, four different students specifically mentioned the color-coding of the parts of speech as a help in organizing the learning and following meaning between the different sections.

Four issues were identified related to the practice and testing interface. First, the navigation was confusing to some users. Several users pointed out one particular navigational choice (the placement of links while in the instructional vs. exercise areas) that caused many moments of confusion for users. Several students directly noted that being able to practice as much as necessary was of great benefit to learning the material. One student also stressed the importance of the feedback given in the practice questions:

Table 10: Qualitative Summary from Student Overall Surveys

Design Focus	Issue Summary
Example Use	<ul style="list-style-type: none"> • Examples were well connected to practice environments; some students noted that there were too many examples, while others commented specifically that they liked the wealth of examples. • Color-coding the parts of speech was very useful for students trying to remember rules between pages in the instruction. • The most difficult sections were those where examples and practice questions did not closely align.
Practice and Testing Interface	<ul style="list-style-type: none"> • Navigation was occasionally confusing and inconsistent. • Being able to have endless practice was a great benefit. • Providing feedback for both correct and incorrect answers helped students learn the concepts during the exercises. • Exercises needed to be more challenging.
Dialect and First-Language Content	<ul style="list-style-type: none"> • Content was interesting to students, but only on a non-involved level. • Many students did not recognize their own language in the dialectical patterns identified because the examples were often "incorrect" standard English, and the students note that they did not speak/write like that.
Professional Content	<ul style="list-style-type: none"> • Content was interesting and motivating to students because they recognize they will soon need to know the professional protocols described in the instruction. • One student recommended being able to see a page of all CoP content, rather than presenting the information always in context of standard grammar.
Other	<ul style="list-style-type: none"> • Users need to be more clearly told they are logged in and what variables they have chosen for the instruction. • The length of the instruction can be imposing to students who do use review all of instruction and practice available to them. • Overall, the instruction was helpful and most students noted some self-assessed learning gains (they felt that they had learned something).

The detailed explanations after each problem are the most important tool for learning the topics. I always read the explanations even when I got the answer right. I suggest having more than two answer choices for each problem. Only two choices makes it easy to figure out the correct answer without thinking very hard.

Some students, like this one, indicated that the exercises need to be as challenging as the final assessment, with more than two answers per question (the final assessment has typically four answer choices per question, sometimes up to six).

In terms of the dialect and first-language instructional content, the students generally indicated that they found the material interesting. However, several students noted that they did not particularly identify with the grammatical patterns described in the instruction. This lack of identification caused students to be confused about the appropriate choice of dialects, especially given the very limited choices available to them in the pilot. One student stated:

I picked Appalachian American English as my first language because I grew up in Southwest Virginia, but I quickly came to feel that I made an incorrect decision. The information in the first-language boxes regarding Appalachian American English did not help me because I do not speak (nor have I ever spoken) like the examples given in the boxes. For example, I have never said "They is..." I felt that the examples of Appalachian English were not really a dialect, but actually just incorrect English. Perhaps this isn't how other students feel, but maybe a description of each of the dialects would help each student choose the correct dialect.

Many students did indicate a more favorable attitude toward the dialect instruction, though not becoming any more self-invested: for example, "Overall,

I think the boxes were very interesting and kind of a refresher from reading through the different sections.”

Students had a much more favorable overall opinion of the information contained in the professional content instruction. They indicated a higher level of self-involvement with the content (for example, “This was useful since I will be working in a professional area soon enough; it gave me good skills that I will need.”) compared to the dialectical information. Students also noted spending more time reviewing the content of these blocks of instruction. One student recommended isolating all instances of business writing instruction for the user to be able to review these specialized topics without reference to standard grammar.

Overall, the two formative evaluation studies provided useful feedback to understanding how this prototype might be best developed into a full-fledged instructional environment. As well, it gave detailed understanding of how the eight proposed design elements (see Tables 3-5) would best assist the learners in a true self-paced, online learning environment. The next chapter discusses these results in more detail.

Chapter 4: Discussion

This chapter reviews the significance of this study to the fields of instructional design and online language learning. It also reviews the revisions and future work that are indicated by the results of this study.

Significance of the Study

The original impulse behind this study was a perceived need to find useful instructional design theories that could be applied to a particular instructional need: how grammar education was being delivered in higher education (Baron, 2002; Berman, 1979; Huddleston & Pullum, 2003; Murray & Kouritzin, 1997; National Commission on Writing in America's Schools and Colleges, 2003; Resnick & Resnick, 1991). Traditional methods of instruction, largely derived from behavioral traditions, are shown to work well in early stages of learning (Berman, 1979; Fogel & Ehri, 2000; McCleary, 1995; Robinson, 1997; Rohde & Plaut, 1999; Scardamalia & Bereiter, 1986), but their inability to push students towards higher levels of performance has left many in the academic community looking for a new way to teach sentence mechanics in higher educational settings (Baron, 2002; Berman, 1979; Burkhalter, 1997; Huddleston & Pullum, 2003; McCleary, 1995). Online technologies, primarily database-driven websites, provide the affordance of being able to contain a relational set of a large number of rules, such as that indicated by the rules of a language like English (Abdullah, 2003; Bartlett, 2003; Huddleston & Pullum,

2003; Lim, 2004; Nagata, 1997; Norman, 1993; Roby, 2004; Sturm & Rankin-Erickson, 2002). These technologies allow the ability to customize and present information differently to different users based upon defined criteria.

This study blended research from three different educational theoretical perspectives in order to determine how the theory would indicate “best practices” for teaching language rules. These three theories were cognitive information processing theory, cognitive schema theory, and situated cognitive theory. From these theories, eight design principles were used to develop a prototype for an online language instruction sequence (see Table 11).

Based on the findings, two contributions were made by this study. First, by balancing three varied educational psychological perspectives to derive the instructional design requirements, an online prototype was created that reflected each perspective. Second, by creating a user-varied learning experience, the instructional environment aided the students in learning and using the grammar in professional situations, reinforcing the advantage of blending all appropriate theories into the instructional design.

Implications for Theoretical Instructional Design

Based on the review of literature, a complex set of instructional needs emerged. The complexity of the design specifications required designing

instructional activities that balanced theoretical requirements from diverse pedagogical perspectives. The ability to take advantage of instructional

Table 11: Research-based Design Elements

Cognitive Foundation	Design Element
Cognitive Information Processing, rule-based theories	1. <i>Example Use</i> : instructional environment richly embedded with examples and nonexamples of “grammar in action”
	2. <i>Infinite Practice</i> : practice environment set-up for “infinite” practice with parallel examples and non-examples – this encourages frequent practice, at the learner’s control, and will lead the learner toward automaticity of the “base” rule for each learning outcome.
Cognitive Schema Theory, process-based theories	3. <i>Internal Schema</i> : user-defined system will identify first-language/dialect for each user in order to identify learner’s internal schema and use that to present additional instruction.
	4. <i>Content Schema</i> : Instruction focuses on grammar rules with a focus on linguistically-functional concepts that can be used for high-level sentence writing
	5. <i>Self-regulation</i> : Online environment and practice environment encourages student’s self-regulation of learning outcomes
Situated Cognition, context-based theories	6. <i>External Schema</i> : user-defined system will identify professional context for each user in order to identify user’s intended or existing community of practice
	7. <i>Situated Learning</i> : supplemental instruction (based on user’s external schema selection) will bring student’s current schema in line with the target practices
	8. <i>Functional Participation</i> : the user-defined environment facilitates the learner in discovering the necessary grammar knowledge to become a functional participant in a chosen professional context

technology that delivered instruction in flexible, diverse methods facilitated the balancing of those theoretical perspectives.

The research foundation began with examining the requirements necessary to learn the basic rules of grammar. The rule-based traditions of CIP suggested that examples and non-examples provide a needed reference for a learner to see rules in action (DeKeyser, 1993, 1996; E. Gagne, 1985). The first principle of the design was to embed a sufficient number of examples and non-examples within the instructional environment, specifically “real-world” examples that would be relevant to the learner (Element 1: Example Use).

Simply placing examples and non-examples into instruction is not enough of a condition to inspire rule learning (E. Gagne, 1985). Rules must be practiced, especially production rules like grammar (R. M. Gagne, 1985; Langacker, 1973). As rule sets become more complex, with many rule systems working on top of each other, proceeding towards the realm of intellectual skill (R. M. Gagne, 1985), the need for practice with clear, relevant feedback also becomes helpful to the learner (DeKeyser, 1993, 1996).

To accomplish this, the instructional environment incorporated many forms of examples and practice. There were ten practice questions for each of the nine lessons within the instruction (Element 2: Infinite Practice). In addition, at the end of each three lessons, there was a practice assessment that consisted of twenty practice questions, formatted identically to the final formal assessment of the instruction. The final formal assessment consisted of forty questions, half of

which were drawn from the practice assessments. Each of these levels of practice could be accessed at any time and as often as each learner liked in order to satisfy the rule-based design elements.

From the research on schema theory, evidence demonstrates that increasing the learners' understanding of their internal schema will increase their likelihood of adopting an instructional schema offered to them, as they will be able to draw specific, small steps that speak to the individual learner's differences (Bereiter & Scardamalia, 1987; Ching, 2002; Hayes & Flower, 1980). This was accomplished in the system by supplementing the "standard" instruction with appropriate instruction based on the dialect/first-language variable chosen by the user. A learner was able to tailor the delivery of the instruction based upon his or her internal language schema, chosen from a set of available instructional units.

The development of the dialect user-preference was not the only design element related to the process-based schema theories. The research also indicated that to encourage learners to adopt the target content schema, two techniques would be useful. First, teaching the learner the "schema" for the target learning objectives would increase the learner's ability to move toward those objectives (Armbruster, 1986). Second, teaching self-regulatory techniques, such as self-evaluation, organizing and transforming information, seeking information themselves, and seeking social assistance when necessary, would enable learners to identify those learning goals and move towards them in

regulated, self-determined steps (Ching, 2002; Graham & Harris, 1997; Zimmerman & Risemberg, 1997a, 1997b).

The instructional environment took several steps to adopt these two techniques. First, all of the content of the instruction was written to encourage students to see not a single grammar “rule” but to see that rule in context of larger grammatical patterns. For example, students were instructed not simply to see verb tense as a rule of verbs, but verb tense as it affects choice of voice (passive, active), mode (conditionality, beginning/ending point), and other aspects of sentence mechanics. This put the emphasis on the general “schema” for grammar knowledge rather than on isolated rule-memorization exercises (Element 4: Content Schema). Second, the introductory material for the instruction and the outline of the instructional system encouraged students to understand the learning objectives and how to move towards them without intervention of any human instructor. The idea is that successful completion of the instruction, within a reasonable amount of time and given a reasonable amount of effort, without intervention of an instructor would indicate a certain degree of self-regulation of learning goals (Element 5: Self-regulation).

In the formative evaluations, many aspects of these two schema-oriented design elements were found to be useful by both students and experts. They indicated on the follow-up surveys that they had a high ability to identify the main learning goals and to move towards them. Overall, both test groups rated

the value of the instruction high. Students spent an average of 2.8 hours on the instruction, and rated the value of the time spent as above-average.

The third group of design elements was centered on situated learning theories that noted the importance of identifying expert rule-usage within targeted communities of practice. Rather than simply focusing on the “standard” grammar rules, these theories focus on the social context for the rule’s usage (Brown, et al., 1989; Fogel & Ehri, 2000; Hannafin, et al., 1997; Hyland, 2003; Lave, 1997; McCleary, 1995; Murray & Kouritzin, 1997).

Three design elements were proposed to accommodate these learning theories. First, similar to the dialectical user-preference, a second user variable was created to allow learners to self-select a target “community of practice,” which in this case indicates a target professional community with whom the student is trying to learn to communicate better (Element 6: External Schema). Once the user selected that variable, the environment would provide supplemental blocks of instruction that indicated the target community-of-practice’s rule preference, especially when there is a noted difference between standard and community practices (Element 7: Situated Learning). This instruction was written in a way to facilitate the learner in being able to become a functional participant in the chosen community of practice, or in other words, to be able to write as an engineer or a business-person (Element 8: Functional Participation).

Blending these eight design elements together resulted in a significant instructional environment, scalable and deliverable because of the affordances of online, database-driven web delivery. Though applied in this case to a grammar-instruction content, this primary result was the development of a database-delivered system that could be usable to deliver any sort of instruction that desired to balance the user's internal schema against an external schema. This study also shows that it is possible to balance instructional environments from multiple educational perspectives. Though the "time-tested" rule-based pedagogies have their place in the instruction, the later theories of situated knowledge and schematic organization of learning do as well.

Implications for Online Language Learning

As some have noted, one of the main disconnects in the teaching of writing and language studies is the lack of practice informed by the best educational research (Baron, 2002; Bartlett, 2003; Bereiter & Scardamalia, 1987; Berman, 1979; Hayes & Flower, 1980). The intent of this study was to demonstrate that instructional activities can be designed that draw on the best available research into language instruction. When designed well, the students should find the instruction engaging, motivating, and helpful to their learning (Armbruster, 1986; Graham & Harris, 1997; Huddleston & Pullum, 2003), while at the same time they are being presented with a high level of complex

instructional content (Baron, 2002; Berman, 1979; Brewster & Klump, 2004; Burkhalter, 1997; Connors, 2000; Garrett, 1986; Hannafin, et al., 1997).

After using the environment, the students' evaluations supported the claim that examples and non-examples were useful to their learning. Both the students and experts found that there were a sufficient number of examples and that the examples were useful and relevant to the learning.

The formative reviews showed overall that both students and experts appreciated the importance of putting one's prior language knowledge into relation with standard grammar practices, which was an important principle of the research (Armbruster, 1986; Burkhalter, 1997; Ching, 2002; Cullen, 1996; Fashola, et al., 1996; Fogel & Ehri, 2000; Garrett, 1986; Graham & Harris, 1997; Ravn & Gelman, 1984; Zimmerman & Risemberg, 1997a, 1997b). Both groups also indicated overall that the information presented in the supplemental dialect instruction blocks was presented well. There were positive comments from both students and experts about the information contained in the supplemental instruction based on dialect.

Of the three groups of design elements, the situated cognitive design elements proved to be most interesting and useful to both the expert and student groups. In terms of impact of the research, one expert quite deftly summarizes the many reasons that a professional, community-of-practice design element was selected:

I think making the professional concentration boxes connect with the kind of writing the student ultimately wants to do successfully is a great idea. I can see how it makes the instruction much more valuable and relevant to their needs. Even if done in a rather basic way (like using terms from marketing in giving examples of subjects and predicates) I would hope that it would at least seem more meaningful to students because the text is something which they wish to familiarize themselves with. To have professionally specific content presented in light of how the sentence is constructed also demonstrates to the student that all writing can be thought of in this way--as a subject for language study.

Students and experts both seemed to agree that the supplemental instruction based on the communities-of-practice were well presented.

Taken together, the instructional environment contributes significantly toward leading students to understanding language instruction in a higher-educational context. This context is one that leads them to becoming full and active participants in the professional communities in which they will eventually find themselves working.

Future Work

Being a study that developed only a prototype of the instructional environment, there are several directions in which future work is indicated. This section will review the revisionary steps that would occur past the prototype stage. The largest issues that surfaced were related to ease of navigation, the use of exercises and examples, and the internal and external schema-based instruction.

Ease of Navigation

One unintended issue that surfaced in the comments by both experts and students was the use of color-coding of the examples. During many of the lessons, the use of a color-coding scheme was used to indicate parts of speech (green for nouns, red for verbs, blue for subject complements, purple for direct objects, and pink for indirect objects). This color-scheme was kept consistent throughout the lessons, and student commented on this color-coding positively: for example, "I did view all of the instructional pages and found the examples to be quite helpful overall. The use of color in the examples to demonstrate the location of the direct object and things of that nature was a great idea! This was one of the most helpful aspects of the Grammar Gym." The experts did warn of the possibilities of accessibility issues, but thought that with proper testing and

tagging of the text, the use of coding between lessons helped students to connect examples together, to build rule upon rule.

However, this color-coding was not sufficient in all cases to hold the instruction together and make it easy to navigate. The comments that were filled out on the page-level surveys and overall surveys describe a common navigation problem as one of either link ordering or color-coding.

The general navigation and terminology of the system did cause some confusion for students, and some noted that they had difficulty at times locating where they were in the overall system. This confusion with navigation would certainly pose a negative impact on the learner's ability to understand the target schema, and might also explain why students were discouraged from practice if it took them away from the central line of instruction they were on.

While the experts did rate the overall quality of the instruction high, they did also note problems with navigation. On a future revision, more use of parallel terminology and a clearer pattern of color use will ease this issue.

Exercises and Example Use

The comments made by both the students and experts on the surveys indicated that the examples were most useful when they were samples of professional sentences of a type students would find in the professional and academic documents they would come to encounter. Several of the suggestions

for revisions made by experts were directed at examples that were not professional in nature, but silly or nonsensical.

Though the environment did offer a lot of practice, students often called for wanting even more exercises. For example, one student said, “Have more practice or little mini quizzes to offer more help. There were some sections that were very long and intense. It might help to separate the information a little more to make it easier to retain.” The students also wanted to see the exercises even more tightly interwoven with the instruction. For further work, it is recommended to make the feedback come from the instruction itself rather than a seemingly separate interface, offering the chance to practice questions directly from any given instructional page. Successfully integrating the exercises with the instruction is an important part of Element 2: Infinite Practice. Not only should there be the presence of the exercises, but the instruction itself should encourage students to practice enough that the rule becomes automatic (DeKeyser, 1993, 1996).

Internal Schema instruction

The instructional elements aimed at first-language instruction (Element 3: Internal Schema) proved to be a sensitive area for some of the experts and a few students as well. Most of the suggestions for revision came from the language used to describe these languages from a perspective of Standard English.

The experts became particularly helpful in narrowing down a reason for this pattern of response to the first-language instruction. Several specific blocks of content were noted as being problematic for one expert or another. Mostly, this was due to possible misreading that they felt a student might undertake when reviewing the material. Given that the intent of the recognition of a student's own internal grammar is partially to place value on personal grammar (Fashola, et al., 1996; Fogel & Ehri, 2000), this is a serious claim. If the issue were consistent for each expert and page, it would be more serious, but often the opinions for a given example were conflicting or inconsistent. This is an issue that can also be handled with continued and consistent expert review of new materials being developed.

In addition, no comments made by students during the page-level or overall surveys referred to any negative stereotypes contained in the instruction. This was an issue reserved for the expert reviewers. The student comments were about a lack of connection to or recognition of self in the content presented in the dialectic/first-language boxes. While the instructional environment does contain a short description of each dialect choice, the prototype was limited in the choices and variability of the information presented to the student.

This seems to indicate a specific need for improvement of the content of the dialect instruction, though the fundamental design idea of allowing students to choose this information was demonstrated as valuable for their learning. In particular, two levels of content-based work would need to be done. First, a

wealth of more content blocks based on a wider range and variety of dialects of American (and British) English and non-English languages is needed. Second, the creation of this instruction should be done in close conjunction with an expert team of reviewers of the content. The experts bring an invaluable perspective in understanding how to explain the linguistic variations without denigrating the marginal or empowering the standard grammar unduly.

External schema-based instruction

Based on evaluation feedback, the external context user variable is a worthwhile system design for helping students prepare themselves to be professional writers, but similar to the first-language instruction, the specific content of the instruction needs to be improved.

While the professional-community instructional blocks were successfully deployed into the prototype, the choices were often limited for the students to get a lot of value from them. Further expanding the available choices of professional content for the community-of-practice blocks of instruction will increasingly highlight the differences between the varied sets of professional and standard grammatical rules. In addition, the instructional content needs to stress more clearly for the learner which rule is preferred by the professional audience and which by a non-professional audience.

Finally, two different students recommended a design interface that would allow them to view the professional information in isolation from the standard grammar. While this idea is immediately interesting and most likely achievable programmatically, it would represent a step in the wrong direction. If the incorporation of professional community knowledge with the student's understanding of standard grammar is to be improved, a greater connection to the standard grammar and its (legitimate) deviations is called for. In fact, that should in turn support a greater use of grammar knowledge schema to convey the grammatical learning and to encourage students' self-regulation of the learning objectives. These will be enhanced by allowing the learners to understand the wider schematic rule variations that occur when filtered through a community-of-practice's target rule set. By increasing both the quantity and quality of the professional instruction blocks, this environment will increase its ability to teach those variations.

Conclusion

This dissertation proposed to follow the first three stages of an instructional design process to develop a learning environment grounded in demonstrable educational research and theory. Relevant design elements from a range of appropriate theories were blended to support learning within a self-paced, student-centered learning environment. This environment was intended to be used as an instructional supplement to classroom learning and was not intended as the sole and only language curriculum for students. Formative evaluations were conducted on a developed prototype of the instruction. These evaluations provided guidance for the future implementation of the final version of the instructional environment (Tessmer, 1993).

The successful elements of the prototype, such as the ability for a user to control the amount of exposure to the instruction and to practice with the concepts on their individual terms, the basic schematic approach to grammar instruction throughout the instruction, and the ability to select user variables to control supplemental instruction, show that it is possible to design an instructional system effectively by blending theoretical approaches in a balanced manner and to enhance a student's ability to learn in an online, self-paced environment.

However, much work remains to be done to finalize the product into one that is ready for implementation. Many of the necessary changes relate to

interface design and can be accomplished with minimal impact on the theoretical development.

The more complex revisions relate to increasing the self-assessment capabilities of the instruction in order to increase the ability for learners to self-regulate their learning objectives, which was a central issue reported by both student and expert pilot groups, and enhancing the ability to collect useful assessment data about the instructional system.

The importance of this issue to the success of the instructional design is supported through the number of comments made by the experts regarding specific cultural representations of language. It is imperative to make the content meaningful to the learner while avoiding the denigration of a culture's language. It is possible to achieve this balance if learners are made more aware of the theoretical schema and purpose of the instruction.

The theoretical schema can be made more obvious to the learner by a careful content-level revision of the instruction, as well as by enhancements to navigation that would allow for such additions as a glossary that would define each available dialect or community-of-practice, giving the chance to explain to the learner one more time why these variable schema are being presented in an instructional context. In addition, making sure that the individual content blocks contain examples that are non-offensive and a-political can be a challenge, but is a crucial step to encouraging the learner

This study shows that, with a solid grounding in educational theory, instructional design can be successfully employed to take into consideration both individual and community needs. If designed well, the instruction generated by the design will continue to grow and change, as the needs of the individuals and communities are better understood or as the needs of the individuals and communities grow and change themselves.

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Appendix A

Documents for Subject-Matter Expert Review

The following is the text that was sent to the Subject-Matter Experts upon their agreeing to do the pilot study. The instructions were sent as a PDF file attached to an email.

How to Use the Grammar Gym: Sentence Module

This document provides information about the pilot study in which you are involved as an expert reviewer. It contains answers to some common questions about using the Grammar Gym: Sentence Module (a Pilot), as well as providing an overview of the actions you will be asked to undertake as a participant in the study.

Where is it?

The Web address for the Grammar Gym: Sentence Module is http://critternut.com.whsites.net/pages.php?page_id=45

How do I get there?

You should be able to use any Web Browser. Firefox v.2.x has been tested thoroughly. Any performance problems should, of course, be recorded in your feedback.

What happens when I get there?

Once you get there, log in using the link in the top right corner of the screen. Your username and password should have already been sent to you in a separate email. If you have any questions, you can email me at marcz@vt.edu.

Logging in puts the supplementary instruction determined by two user-provided variables (dialect/first language and professional field of interest) into action. If you want to review or change these preferences, use the "User Preferences" link on the main navigational bar. Feel free to experiment with different settings to see how other dialects and languages approach Standard English!

Once you log in and verify your user preferences, you can access any of the following sections, in any order you desire:

- introductory material – where the instruction and environment is explained to the user
- the instruction – where the main instructional pages are housed
- the exercises and testing – where the instructional concepts can be practiced and a user can test himself or herself on those concepts.

Where exactly you go is up to you and is part of the study. It is relatively easy to move around in the Gym. Look for the navigation on the sidebar, and you will see the three general areas of introduction, instruction, and testing outlined.

What is being studied in this pilot study?

In general, this pilot study seeks to make the instruction you are about to see more “effective, efficient, interesting/motivating, usable, [and/or] acceptable” (Tessmer 1993). Your feedback has been sought as part of a representative expert audience, and it will assist me in improving and evaluating the design principles that led to the creation of this instruction. Each expert reviewer brings a different set of expertise to the study, and as such, feedback from all of you is very much appreciated.

How do I know I “finished” the instruction?

One of the tricky things about these online environments is that they do not have a clear beginning and end. There is a three-unit structure to the Gym, with each unit containing three lessons. Following each of the lessons seems a logical way to proceed. There is also the practice exercise environment that can be accessed at

anytime – whether you do the exercises before, during, or after the instructional content is up to you. Finally, at the end of each workout there is a practice test (the “Fitness Trials”) and at the end is a Fitness Test, offering a final, over-arching assessment of the instruction.

The ability to pass that final assessment is the way students can gauge whether they are “finished” with the instruction or not. As an expert reviewer, you are asked to “get a good sense” of the pattern and organization of the environment. You may not need to review each page, or to take each test. I do invite you to visit each area, however, and to “test out” the environment as a student would experience it.

Those experts who represent a particular expertise in a dialect and/or professional field of interest have been provided with a specific list of pages of particular interest to that expertise; the general experts are asked to explore as they wish. That provided list should not be seen as restrictive; it is meant as suggested guide to maximize your time and evaluative effort.

One of the instructional goals is for each user to get a sense of the breadth of instructional material, and for that user to be able to

assess whether the material has been learned. I invite you to do the same.

What do I do if I am finished?

First, thank you again! Your time and effort will be put to good use in the development of instruction that will hopefully help many students to come.

Second, you might have seen this within the Gym environment, but please be sure to visit this page before finishing your time with the Gym:

http://critternut.com.whsites.net/pages.php?page_id=70

This provides a link to the final overview survey for the Gym, and it is the most important data collection survey.

On each survey, your name was collected, and the only other request I ask of you is that I may contact you if I have any questions about those comments.

Once again, thank you so much for your participation in my pilot study. If you would like, you can download a PDF version of these instructions.

Surveys for Subject-Matter Expert Review

Figure 4 is a screen-shot of the survey that subject matter experts could fill out in order to make a comment about any given page they were reviewing in the instruction.

Page Feedback: Grammar Gym Sentence Module

This survey can be used to report feedback on any given specific page within the Grammar Gym: Sentence Module. If you see something that works well or doesn't work well, feel free to make a specific comment here.

Because I am relying on your expertise, this survey is not being submitted anonymously. Please provide your name in the space below. I will only contact you if clarity is needed on one of your provided comments.

The questions below are organized according to design elements of which I am particularly interested. You do not need to answer all questions in this survey. Feel free to answer as many or as few of the questions for each page that you would like.

As always, if you have any questions, feel free to contact me at grammargym@gmail.com.



The URL is available from the browser when looking at the page. The browser window was left open when this survey was launched. You should be able to switch over to it and retrieve that URL. Just copy and past the full URL (e.g., "http://critternut.com.whsites.net/pages.php?page_id=45") in the URL field.

URL:

Name:

- 1. On a scale of 1 to 5, how useful do you find the examples on this page?**
 1, Very Useful 2 3, Average 4 5, Not Useful
- 2. On a scale of 1 to 5, how would you rate the quantity of examples on the page?**
 1, the correct number of examples 2 3, a pretty good number of examples 4 5, a great deficiency of examples
- 3. On a scale of 1 to 5, how relevant to professional/academic writing were the examples on the page?**
 1, very relevant 2 3, somewhat relevant 4 5, not relevant at all
- On a scale of 1 to 5, how much do you agree with the following statements?**
- 4. The instruction on the page encourages the student to practice with the concept.**
 1, completely agree 2 3, somewhat agree 4 5, completely disagree
- 5. The instruction on the page focuses on grammatical rules that would be helpful in forming high-level sentences.**
 1, completely agree 2 3, somewhat agree 4 5, completely disagree
- 6. The instruction on the page helps the learner to organize and work towards clear learning goals.**
 1, completely agree 2 3, somewhat agree 4 5, completely disagree
- 7. The instruction on the page helps to situate the rule within professional-use contexts.**
 1, completely agree 2 3, somewhat agree 4 5, completely disagree
- 8. The instruction on the page helps the learner to distinguish between their own internal rules and the standard and professional variations of the rules.**
 1, completely agree 2 3, somewhat agree 4 5, completely disagree
- 9. Each page includes a rule in standard English. Some pages also include supplementary instruction based on a user-defined variable of dialect/first-language and professional field of interest. Did this page provide instruction in either or both of these supplementary areas? (check one or both if applicable)**
 dialect/first language
 professional field
- 10. Would you like to make any other comments about the examples on the page?**
- 11. Would you like to make any other comments about the instruction on the page?**
- 12. Would you like to make any other comments on this page at all?**

Figure 4: Page-level Survey for Subject-Matter Expert Review

Figure 5 is a screen-shot of the survey that subject matter experts were asked to fill out at the end of their review.

Overall Feedback - Expert Study

This final survey offers you an opportunity to reflect on what you have seen in the Grammar Gym: Sentence Module. I have asked some questions below that are correlated to the aspects of the instructional design I am studying: the use of examples and practice, the ability for students to identify and meet instructional objectives, and the effectiveness of the supplementary instruction in assisting students in understanding the instruction. I have also provided a space for you to reflect openly on any other aspect or idea that you have. Your feedback here will help me organize both a short- and long-term plan for development for this project, and I thank you for that! I have asked for you to enter your email, in case I need to clarify any statements you make below. If you have any concerns about this, please [contact me](#).



Name:

Instruction and Examples

1. On a scale of 1 to 5, how do you rate the quality of the instruction to the student?
 1 (not valuable) 2 3 (average) 4 5 (very valuable)
2. On a scale of 1 to 5, how would you rate the quantity of examples on the instructional pages?
 1 (too many) 2 3 (satisfactory) 4 5 (too few)
3. On a scale of 1 to 5, how would you rate the usefulness of examples on the instructional pages?
 1 (not useful) 2 3 (satisfactory) 4 5 (absolutely vital)
4. On a scale of 1 to 5, how would you rate the relevancy of examples on the instructional pages to student learning?
 1 (not relevant) 2 3 (relevant) 4 5 (absolutely needed)
5. Use this space to comment on the examples in the instruction. Was there anything good or bad that you would like to note?

Navigation and Learning Goals

6. On a scale of 1 to 5, how did you find the navigation in the site?
 1 (difficult to understand) 2 3 (clear after time) 4 5 (easy to pick up)
7. On a scale of 1 to 5, how easy do you believe it would be for a student to understand how to use both the instructional and exercise environments to identify learning objectives and move towards them?
 1 (very difficult) 2 3 (average) 4 5 (very easy)
8. On a scale of 1 to 5, in your opinion, how worth the investment of time for a student would this instruction be?
 1 (not worth it) 2 3 (average) 4 5 (very worth it)
9. On a scale of 1 to 5, how helpful was the practice (exercises and fitness trials) to understanding the instruction?
 1 (not helpful) 2 3 4 5 (very helpful) "I haven't seen them"
10. Use this space to make a comment about the exercise practice elements for the site. Was there anything useful or not useful about the practice aspects of the instruction?

Supplementary Instruction (Dialect/First Language and Professional Field of Interest)

11. On a scale of 1 to 5, in general, how useful is understanding one's own dialectic/first language grammar to understanding standard English patterns?
 1 (not useful) 2 3 (satisfactory) 4 5 (absolutely needed)
12. On a scale of 1 to 5, in general, how useful is understanding the variations from one's professional writing protocols to understanding standard English patterns?
 1 (not useful) 2 3 (satisfactory) 4 5 (absolutely needed)
13. On a scale of 1 to 5, how much does this instructional environment encourage students to understand their own dialectic/first language grammar in order to understand the differences between that dialect/first language and Standard English grammar?
 1 (not encouraged) 2 3 (encouraged) 4 5 (highly encouraged)
14. On a scale of 1 to 5, how much does this instructional environment encourage students to understand their own professional writing protocols in order to understand the differences between that professional standard and Standard English grammar?
 1 (not encouraged) 2 3 (encouraged) 4 5 (highly encouraged)
15. On a scale of 1 to 5, in general, how well was the information in the first-language boxes presented?
 1 (not well) 2 3 (satisfactory) 4 5 (very well)
16. On a scale of 1 to 5, in general, how well was the information in the professional-concentration boxes presented?
 1 (not well) 2 3 (satisfactory) 4 5 (very well)
17. Use this space to make a comment about the information presented in the first-language choice boxes. Was there anything in particular that was useful or not?
18. Use this space to make a comment about the information presented in the professional-concentration boxes.
- Anything else?
19. Would you like to make any other comments about the instruction? (If your response is longer than this text box provides for, feel free to send these responses via email attachment to grammargym@gmail.com.)

Figure 5: Overall Survey for Subject-Matter Expert Review

Appendix B

Documents for Student-User Review

The following is the text that was sent to the student users upon their agreeing to do the pilot study. The instructions were sent as a PDF file attached to an email.

How to Use the Grammar Gym: Sentence Module

This document should answer some of your basic questions about using the Grammar Gym: Sentence Module (a Pilot).

What is this pilot study?

In general, this pilot study is attempting to develop a good online grammar instruction environment. Your feedback will be vital as part of a representative audience that will use the Grammar Gym. With your help, I can improve the instruction and evaluate the design principles that led to the creation of this instruction.

What will be asked of me?

There are two main components of your participation in the study:

- 1) Using the instruction as any other student would do. Your overall goal to that extent is to be able to pass the final fitness test with an 85% or better.
- 2) Reviewing the pages of instruction, keeping track of the time of your learning, and evaluating the instructional environment.

Overall, this study should take around 3-5 hours of your time.

What will I receive if I participate?

Dr. Hagedorn has agreed to offer you 5% extra credit towards your final grade in the course upon successful completion of the instruction. When you pass the final assessment, she will receive an email that you have completed the instruction and at that point, you will receive the extra credit.

What if I do not want to participate in the pilot study?

Dr. Hagedorn has another extra credit opportunity that she will offer to you for equivalent credit. Participation in this study is completely voluntary; you may begin the instruction and withdraw

from the study at any time. However, you will not receive the extra credit unless the pilot study is completed.

How do I begin?

The Web address for the Grammar Gym: Sentence Module is

http://critternut.com.whsites.net/pages.php?page_id=45

How do I get there?

You should be able to use any Web Browser. Firefox v.2.x on Windows XP has been tested fairly thoroughly. Any performance problems should, of course, be recorded in your feedback.

What happens when I get there?

Once you get there, you need to use the "New User?" link in the top right corner. On this page, you will be asked to provide some user information, to create a username and to set a password you prefer. In addition, you are also asked to choose two different personal variables:

- (a) first language/dialect – this should be the first language or dialect of American English that you learned. If your first language is not represented on the list, choose “other” and note your first language on the overall, final survey comments.
- (b) professional field of interest – this should be the professional field you are or plan to be working in. If your choice is not represented on the list, choose “other” and note your professional field on the overall, final survey comments.

After you add your account, return to the “Login” link at the top left and login with that new user information. If you lose your login information, you can contact us at grammargym@gmail.com.

Logging in puts the supplementary instruction determined by the two uservariables into action. If you want to change these preferences, there is a link on the Gym homepage and the main side navigation to change those settings. Feel free to experiment with different settings to see how other dialects and languages approach Standard English!

Once you log in, each user will have access to three different areas of the Gym:

- the introductory material
- the instruction
- the exercises and testing

That direction is up to you, and is part of the study. It is relatively easy to move around in the Gym. Look for the navigation on the sidebar, and you will see the three general areas of introduction, instruction, and testing outlined. In addition, there is a special link at the bottom of each instructional page for the pilot study participants to be able to evaluate and comment on each and every page of the gym.

How do I know I “finished” the work?

One of the tricky things about these online environments is that they do not have a clear beginning and end. There is a three-unit structure to the Gym, with each unit containing three lessons. Following each of the lessons seems a logical way to proceed. There is also the practice exercise environment that can be accessed at anytime – whether you do the exercises before, during, or after the instructional content is up to you. One of the instructional goals is for each user to get a sense of the breadth of instructional material, and for that user to be able to assess whether the material has been learned.

Do I need to take the Fitness Test?

Yes. The Fitness Test serves as a final assessment for the instruction in the Grammar Gym. In other words, if you can pass this test, you can feel assured that you “know” that material in the Gym.

In addition, passing the final test will send Dr. Hagedorn a note to indicate that you have completed the pilot study and can receive the extra credit.

What do I do if I am finished?

First, thank you again! Your time and effort will be put to good use in the development of instruction that will hopefully help many students to come.

Second, you might have seen this within the Gym environment, but please be sure to visit this page before finishing your time with the Gym:

http://critternut.com.whsites.net/pages.php?page_id=70

Surveys for Student-User Review

Figure 6 is a screen-shot of the page-level survey that students could optionally fill out to make comments on any particular page in the instructional environment.

Page Review - Students

Instructions: On this survey, complete each question below. Most questions are either in a multiple-choice or short-answer format. For this survey, focus on the page-level content. That is, answer the questions based on the web page that you saw right before you came here. After you fill out the short survey below, click on "Submit." After completing the survey, close this window, and return to your work right where you were in the Grammar Gym! Thank you again for your time and effort in making this instruction as effective as we can.



Copy and Paste in the URL for the page on which you are commenting (it should still be open in another window and it should look like http://critternut.com.whsites.net/pages.php?page_id=45)
 URL:

1. On a scale of 1 to 5, how well do you understand the concept illustrated on the page you were viewing?
 1 (not well) 2 3 (moderately well) 4 5 (very well)
2. On a scale of 1 to 5, how useful were the examples on the page you were viewing?
 1 (not useful) 2 3 (average) 4 5 (very useful)
3. On a scale of 1 to 5, how much practice did you do, or do you anticipate needing to do, to understand the concept on the page you were viewing?
 1 (not much practice needed) 2 3 (some practice needed) 4 5 (much practice needed)

Many instructional pages contain "supplemental" instruction based upon your chosen dialectical and professional-field user variables. The next two questions pertain specifically to that supplemental instruction; if your page did not contain one or the other of these elements, feel free to skip questions that are not relevant.

4. On a scale of 1 to 5, how relevant was the instruction in the first-language box to your understanding of the concept presented on the page you were viewing?
 1 (not relevant) 2 3 (satisfactory) 4 5 (absolutely vital)
5. On a scale of 1 to 5, how relevant was the instruction in the professional-concentration box to your understanding of the concept presented on the page you were viewing?
 1 (not relevant) 2 3 (relevant) 4 5 (absolutely vital)

6. Most important to me are your own words about your experience. What else would you like to say about the page you were viewing?

Figure 6: Page-level Survey for Student-User Review

Figure 7 is a screenshot of the overall survey that student users were required to fill out at the completion of the pilot study.

Overall Feedback - Student



This final survey offers you an opportunity to reflect on what you have seen in the Grammar Gym: Sentence Module. I have asked some questions below that are correlated to the aspects of the instructional design I am studying: the use of examples and practice, the ability for students to identify and meet instructional objectives, and the effectiveness of the supplementary instruction in assisting students in understanding the instruction. I have also provided a space for you to reflect openly on any other aspect or idea that you have. Your feedback here will help me organize both a short- and long-term plan for development for this project, and I thank you for that!

Examples

1. On a scale of 1 to 5, how would you rate the quality of the instruction?
 1 (not valuable) 2 3 (average) 4 5 (very valuable)
2. On a scale of 1 to 5, how would you rate the quantity of examples on the instructional pages?
 1 (too many) 2 3 (satisfactory) 4 5 (too few)
3. On a scale of 1 to 5, how would you rate the usefulness of examples on the instructional pages?
 1 (not useful) 2 3 (satisfactory) 4 5 (absolutely vital)
4. On a scale of 1 to 5, how would you rate the relevancy of examples on the instructional pages to your overall learning?
 1 (not relevant) 2 3 (relevant) 4 5 (absolutely needed)
5. Use this space to comment on the examples on the page you were viewing. Was there anything good or bad that you would like to note?

Navigation, Exercises, and Learning Goals

6. On a scale of 1 to 5, how did you find the navigation in the site?
 1 (difficult to understand) 2 3 (clear after time) 4 5 (easy to pick up)
7. On a scale of 1 to 5, how easy was it for you to understand how to use both the instructional and exercise environments to identify learning goals and move towards them?
 1 (very difficult) 2 3 (average) 4 5 (very easy)
8. How many hours did you spend on the instruction? (In hours, for example "4.25" would represent 4 hours, 15 minutes. Please round to the nearest quarter-hour.)
 # of hours: |
9. On a scale of 1 to 5, in your opinion, how worth the investment of time was this instruction?
 1 (not worth it) 2 3 (average) 4 5 (very worth it)
10. On a scale of 1 to 5, how helpful was the practice (exercises and fitness trials) to understanding the instruction?
 1 (not helpful) 2 3 4 5 (very helpful) "I haven't seen them"
11. Use this space to make a comment about the exercise practice elements for the site. Was there anything useful or not useful about the practice aspects of the instruction?

Supplemental Instruction: First Language/Dialect and Professional Field of Interest

12. On a scale of 1 to 5, in general, how useful is understanding one's own dialectic/first language grammar to understanding standard English patterns?
 1 (not useful) 2 3 (satisfactory) 4 5 (absolutely needed)
13. On a scale of 1 to 5, in general, how useful is understanding the variations from one's professional writing protocols to understanding standard English patterns?
 1 (not useful) 2 3 (satisfactory) 4 5 (absolutely needed)
14. On a scale of 1 to 5, how much did this instructional environment encourage you to understand your own dialectic/first language grammar in order to understand the differences between that dialect/first language and Standard English grammar?
 1 (not encouraged) 2 3 (encouraged) 4 5 (highly encouraged)
15. On a scale of 1 to 5, how much did this instructional environment encourage you to understand your own professional writing protocols in order to understand the differences between that professional standard and Standard English grammar?
 1 (not encouraged) 2 3 (encouraged) 4 5 (highly encouraged)
16. On a scale of 1 to 5, in general, how well was the information in the first-language boxes presented?
 1 (not well) 2 3 (satisfactory) 4 5 (very well)
17. On a scale of 1 to 5, in general, how well was the information in the professional-concentration boxes presented?
 1 (not well) 2 3 (satisfactory) 4 5 (very well)
18. Use this space to make a comment about the information presented in the first-language choice boxes. Was there anything in particular that was useful or not?
19. Use this space to make a comment about the information presented in the professional-concentration boxes.

Anything Else?

20. Would you like to make any other comments about the instruction? (If your response is longer than this text box provides for, feel free to send these responses via email attachment to grammargym@gmail.com.)

Figure 7: Overall Survey for Student-User Review