Inquisitivism: The Evolution of a Constructivist Approach for Web-Based Instruction

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ABSTRACT

This chapter introduces, Inquisitivism as an approach for designing and delivering web-based instruction that shares many of the same principles of minimalism and other constructivist approaches. Inquisitivism is unique in that its two primary or first principles are the removal of fear and the stimulation of an inquisitive nature. The approach evolved during the design and delivery of an online full credit university course.

The results of a quasi-experimental design based study revealed that online students in the inquisitivism based course scored significantly higher on their final project scores, showed no significant difference in their satisfaction with their learning experiences from their F2F counterparts, and had a reduction in fear or anxiety toward technology. Finally, the results revealed that there was no significant difference in final project scores across the personality types tested. The author hopes that Inquisitivism will provide a foundation for creating effective constructivist based online learning environments.

Keywords: asynchronous education, constructivism, constructivist, distance learning, inquisitivism, minimalism, online course, online learning, web-based instruction

INTRODUCTION

The purpose of this chapter is to support my claim that inquisitivism (my adaptation of minimalism) is an effective constructivist online learning approach for adult learners who are required to learn new information technologies in a web-based setting. Inquisitivism has emerged from the author's ten years of experiences in course development and teaching in online and distance learning environments. Since the fall of 1996 over 3600 University of Alberta

students have completed either the full credit undergraduate online course EDIT 435 or its graduate equivalent EDIT 535. These courses have been, and are still currently, delivered exclusively online with no face-to face (F2F) interaction. They are officially called *The Internet: Communicating, Accessing and Providing Information* (Montgomerie & Harapnuik, 1996, 1997) but are colloquially referred to as "*Nethowto";* which is also the web name of the course and subsequently the nickname that was adopted by students and faculty. In addition, several other courses based on the inquisitive approach have been designed and delivered by the author in both the academic and professional training environment.

This presentation of the inquisitivism, its development, its application and evaluation findings presented here are not based on a single case study or a "one-off" but are based on body of data and experiences collected over a ten year period. The inquisitivism approach was first formalized in 1998 (Harapnuik), was updated in 2004 (Harapnuik) and has been continually revised. Inquisitivism and its application continue to evolve in response to the needs of the authors primary academic responsibility—his students.

CONSTRUCTIVIST APPROACHES LIKE MINIMALISM ARE EFFECTIVE FOUNDATIONS FOR DESIGNING TECHNOLOGY INSTRUCTION.

There is a body of literature that calls for a change in the way we design and deliver educational material: *Objectivism vs. Constructivism: Do we need a new paradigm?* (Jonassen, 1991), *Web-based distance learning and teaching: Revolutionary invention or reaction to necessity* (Rominiszowki, 1997), *The Learning Revolution* (Dryden & Vos, 1994), *Transforming learning with technology: Beyond modernism and post-modernism or Whoever controls the technology creates the reality* (Jonassen, 2000), and *Beyond reckoning: Research priorities for redirecting American higher education* (Gumport, Cappelli, Massey, Nettles, Peterson,

Shavelson & Zemsky, 2002). The authors of these works argue that traditional forms of instruction are no longer effective. There are also claims that the deficiencies in the outcomes of learning are strongly influenced by underlying biases and assumptions in the design of instruction (Rand, Spiro, Feltovich, Jacobson, & Coulson, 1991). The systems approach to instructional design may be the primary factor contributing to the poor outcomes of instruction since it is still the predominant instructional design assumption used throughout most of education (Carroll, 1990; Dryden & Vos, 1994; Hobbs, 2002; Jonassen, 1997; Newman & Scurry, 2001; van der Meij & Carroll, 1995).

The systems approach is based on the assumption that learners are passive receptacles for information that the instructor (teacher or instructional media) relays. Educators are beginning to recognize:

> that our dominant paradigm mistakes a means for an end. It takes the means or method called "instruction" or "teaching" and makes it the end or purpose.... We now see that our mission is not instruction but rather that of producing learning with every student by whatever means work best. (Barr & Tagg, 1995, p. 14).

Similarly, Carroll (1990) argued against the notion that learners are passive receptacles and made a case against the systematic approach to learning in his book the *Nurnberg Funnel*. The title refers to the legendary funnel of Nurnberg that was said to make people wise very quickly by simply pouring knowledge into them. The title is also a somewhat sarcastic accusation against traditional forms of instruction.

In the *Nurnberg Funnel,* Carroll presented minimalism as the culmination of ten years of empirical research that showed that newer methods of instruction based on constructivism and other cognitive theories or approaches perform much better than the commonly used systems

approach to instruction. Constructivists posit that knowledge is constructed, not transmitted and that it results from activity. They also hold that knowledge is anchored in the context in which learning occurs and that "meaning making" is in the mind of the knower, which necessitates multiple perspectives of the world (Jonassen, 1990, 1991, 1997). Meaning making is prompted by problems, questions, confusion or even disagreement and this meaning making is generally distributed or shared with others through our culture, tools and community (Jonassen, 1990; 1991; 1997, 1998; Kearsley, 1997; Strommen & Lincoln, 1992; Vygotsky, 1978).

Carroll's (1990) research revealed that instruction based on guided exploration (GE) was significantly more effective than the traditional systems approach. Out of a group of twelve participants at the IBM Watson research facility, six used (GE) cards and the other six were given the traditional systems-style manual (SM). Both groups were expected to complete their respective training by working through either the drill or practice of the systems-style manual, or the twenty-five GE cards. Both groups were evaluated by being required to complete a real task of transcribing a one-page letter into a word processor and printing it out. The participants were asked to think out loud, and research associates recorded their thoughts. In addition, the sessions were video taped so that all the data could be collated and taxonomized to develop a qualitative picture of how GE learning was contrasted by SM learning.

The use of guided exploration cards resulted in much faster initial learning and more successful performance in the achievement task. The learning time for the GE participants, on average, was less than half of what it was for their SM counterparts; 3 hours and 55 minutes vs. 8 hours and 5 minutes (Carroll, 1990). Similarly, GE participants spent half as much time on the achievement task as did their SM counterparts, and the GE group achieved much greater success than the SM group. The GE group spent more time working on the actual system trying out more

operations than the SM group who spent most of their time reading about the system. Not only did the GE group work effectively with the operations needed to complete their task, they experimented with many more aspects of the system.

Carroll (1990) argued that the GE group was more successful because they worked with the system itself and took responsibility for their own learning. They demonstrated much more initiative and used errors as learning experiences. In contrast, the SM group often became trapped in error loops created by the systems-style manual. The problems the SM group experienced with the instructional material hindered or, in some cases, even prevented the learners from working with the system they were attempting to learn.

Carroll, (1990, 1998) also argued that there is a need for a change in the way instruction is developed and delivered and offered minimalism as a viable option for this change. An examination of the learning theory literature also reveals many theories and approaches to learning. A partial list includes structuralism, functionalism, connectionism, behaviorism, objectivism, and constructivism. When you add all the other theories that are not suffixed with an "ism" (classical conditioning, information processing model, etc.) there are over fifty learning theories and approaches (Kearsley, 1997).

Perhaps one reason that there are so many theories and approaches is that their authors have also sought out theories to substantiate or validate their research and they, too, found that there was no single theory or approach that accurately supported or represented their work. When a suitable comprehensive theory or approach is not found, it is not uncommon for the researcher to propose new concepts and combine elements of other theories and approaches into a new approach that could be applied specifically to a unique situation. This partially explains the creation of the inquisitivist approach.

DEVELOPMENT AND EVOLUTION OF INQUISITIVISM

Inquisitivism is a descriptive approach to designing instruction. It shares many of the same principles as minimalism but offers two key principles or components that set it apart. These two principles are co-dependent in the sense that the second principle cannot be realized without the first. The first principle of the inquisitivist approach is the removal of the fear that many adults have when first faced with learning to use technology. Many adults who are new to technology are virtually paralyzed when placed in front of a computer. The fear of "breaking something" or perhaps the fear of looking or feeling foolish often prevents these adults from embracing computers and technology (DeLoughry, 1993; Shull & Weiner, 2000).

The second most significant, or dependent, principle is the stimulation of inquisitivism. By designing instruction that reduces the "hurt level" and encourages the "HHHMMM??? What does this button do?" approach/attitude to learning, adults can be encouraged to learn in a similar fashion that children learn (Harapnuik, 1998). Exploring and discovering the power and potential of computers, and technology in general, can be an exciting and stimulating process if the learner is confident that they "can't break the system" or that the system "won't break them." With fear reduced and the inquisitive nature stimulated, it can be argued that adults can have almost the same level of success with technological learning as children. An inquisitivist approach to learning technology is essential because technology is dynamic and is rapidly changing, forcing learners to continually adapt to these changes.

Another significant factor about inquisitivism is that the approach was developed (and continues to evolve) during the development and continued delivery of the *Nethowto* web-based course. The development of the inquisitivist approach was a practical response to a need and was the result of a search for a theoretical foundation for the design, development, and delivery

of the course. As *Nethowto* evolved, it became clear that many of the principles that ultimately became foundational to inquisitivism were at work in the development of the course.

In 1997 and 1998, the third and fourth year the *Nethowto* course was delivered and the second and third year it was delivered exclusively online, the minimalist approach was researched and even though it was originally designed as an approach for document design, components of its rubric seemed very appropriate to, and were applied to, *Nethowto*. During this time it became apparent that even though minimalism satisfied many of the instructional design needs of *Nethowto* and had the potential of providing a sound theoretical foundation for the course, it was lacking in two key areas—fear removal and social interaction. Kearsley (1998) affirmed the "solid theoretical foundation for minimalism" (p. 395) but also pointed out that it does have theoretical gaps. The most significant gap in minimalism is that it does not address the social aspect of learning (Kearsley, 1998). A lesser gap is that minimalism has not been tested in a variety of media, specifically online systems. As a result the adaptation of minimalism proceeded and, inquisitivism was formalized in 1998 (Harapnuik). Table 1 offers a comparison of inquisitivism to the constructivist learning environments (CLE) and minimalist rubric from which it ultimately evolved.

It must be noted that many of the same principles apply to all three approaches. For example, all three approaches share the need for students to work on real world tasks in genuine settings. As would be expected of constructivist approaches, all three emphasize knowledge construction, whether it is called reasoning and improvising or discovery learning. Since inquisitivism is an adaptation of minimalism, it shares even more of the same principles. Inquisitivism is continually evolving, but there are currently ten key concepts/components that make up the approach.

Table 1. Comparison of constructivist learning environments, minimalism and inquisitivism

Constructivist Learning Environments	Minimalism	Inquisitivism
Provide multiple representation of reality	Reasoning and Improvising	Fear removal
Avoid oversimplification of instruction by representing the natural complexity of the real world	Getting started fast	Stimulation of Inquisitiveness
Present authentic task (contextualizing rather than abstracting)	Training on real tasks	Getting started fast
Foster reflective practice	Using the situation	Using the system to learn the system
Focus on knowledge construction, not reproduction	Reading in any order	Discovery learning
Enable context-dependent and content-dependent knowledge construction	Supporting error recognition and recovery	Modules can be completed in any order
Support collaborative construction of knowledge through social negotiations not competition among learners for recognition.	Developing optimal training designs	Supporting error recognition and recovery
	Exploiting prior knowledge	Developing optimal training designs
		Forum for discussion and exploiting prior knowledge
		Real world assignments

APPLICATION OF INQUISITIVISM TO *NETHOWTO*

Carroll (1990) stated that taking checklists seriously is perhaps the most typical and debilitating design fallacy. Despite this strong statement, Carroll provided a rubric of minimalist principles. Similarly, inquisitivism has evolved into an approach with a rubric of principles. An early version of the following ten principles was applied to the *Nethowto* course during a significant re-design of the course in the fall of 1998. It must also be noted that the course is still running and both course and the ten principles have continued to evolve.

Fear Removal

Dealing with the paralyzing fear that many adult learners experience must precede the stimulation of one's natural inquisitiveness. Demonstrating that the computer or any other piece of technology is not fragile, providing explanations, examples and solutions for common errors and problems, and the application of data backup will help quell the adult learner's fear.

In an asynchronous education and web-based environment, an instructor is not able to interact directly in person with an entire class (i.e., some students may be working in a different time zone) and to re-assure the group as a whole. Nor can an instructor gauge body language or tone and inflection of voice to detect that fear may be an issue. Furthermore, both email web-based conferencing interactions, which are essential to web-based learning, are not direct forms of interaction but are considered mediated transactions (Harasim, 1993; Lapadat, 2002). Because of these dynamics, fear or anxiety removal is perhaps one of the most challenging components to effectively facilitate,

primarily because the F2F cues are missing and students cannot be led through their anxieties. Using video or audio files to present what would be presented in a traditional F2F setting was, until recently, not a feasible option. While it is possible to use compressed video or audio to communicate with students now, there still is the issue of getting students over the initial fear or anxiety that they may have to operate this type of software for the very first time.

Because of these limitations, the asynchronous nature of the course, and the need to keep pages small to load quickly, the actual design and layout of the course main Webpage had to be a primary factor in calming the fearful student. The main page (and the entire site for that matter), by design, is very simple and uncluttered. Students are not overwhelmed by choices on the main page, and a large “Getting Started” heading was strategically placed to be one of the first items noticed on the page.

The actual Getting Started instructions (referred to as First Steps) were broken down into 4 simple steps. The items in the four steps were designed to lead a student through the initial familiarization with the course. Students were not required to actually complete any assignments but were still required to familiarize themselves with the course navigation and layout, to fill out a consent form (data was also used to create student profiles in the course administration system), to join the course conferencing system and, finally, review the introduction module.

The intention of the Getting Started page was that by following the four steps, fearful students would gain enough experience and success with the course to help them overcome or, at minimum, deal with their fear. While these four steps appear to be linear SI type system super-imposed on a minimalist structure, students can do the steps out of

sequence or ignore them all together and still proceed through the course, so the sequencing aspect of Systematic Instruction (SI) is not a factor in student progression. At some point, and in some order, students will have to fill out the consent form, join the conferences and begin work on the introduction module. These instructions are simply presented in their most logical order. Throughout the steps, students were encouraged to contact the instructor directly if help was needed. Students had (and currently still do have) access to the course instructor via email, the web-based conferencing system called the *WebBoard* (WebBoard Collaboration Server, 2005) and by phone.

Stimulation of Inquisitiveness

With the fear abated, the adult learner's intrinsic (but often suppressed) inquisitive nature can be stimulated and encouraged to flourish. Nethowto students are actually encouraged to read the "HHHMMM??? What does this button do?" approach article that is linked on the main page. The article details the ten inquisitivist principles and makes an argument for this approach as the basis for Web-based instruction.

The design of the course forces the students to make many more decisions and to extensively investigate and use computer programs more than they are often used to. For example, in the first formal assignment, students are asked to submit an email attachment, but they are not required to use a specific email client or word processor. Students are directed to resources that they can use to learn about email, email clients and the sending of attachments. In addition, students are required to investigate one aspect of attaching documents that most people take for granted, the encoding format. The only way that students can be sure that they submit an attachment in the required MIME encoding format is to explore the online Help within their email clients or on the Web. This starts

the whole inquisitivist process. Students quickly learn that a small amount of investigation within the programs they are currently using will reveal the results that they need. The immediate success students experience is a crucial aspect of inquisitivist design that will be further expounded in the getting started fast category below.

Using the System to Learn the System

All training must take place on the actual system that is being learned. Every aspect of *Nethowto* is conducted online. Students are actually using the Internet while learning about all forms of Internet communication and accessing and sharing of information. In addition to the students conducting all aspects of the course online, the instructor of the course (the author) does not maintain an office at the University of Alberta campus but conducts all aspect of design, development and delivery of the courses completely online. In essence, the instructor uses the system to teach the system.

Getting Started Fast

Adult learners often have other interests than learning a new system. The learning they undertake is normally done to complement their existing work. The "welcome to the system" prefaces and other non-essential layers in an introduction are often ineffective uses of the learner’s valuable time.

The Getting Started/First Steps sections of the course are designed to give students confidence in their initial experience with the course. The simple procedures that students are asked to follow, like joining the course conferencing system and using an online form to submit their student information, contribute positively to their learning experience. Similarly, all the information that students are required to review in the

Getting Started section of the course is intended to contribute immediately and positively to their learning experience and ultimately give the learner confidence in the system.

The first assignment, submitting an email attachment, is relatively simple to complete and is strategically placed and used to give students immediate success. Students usually make the email submission immediately after moving through the Getting Started section and a consistent effort is made to insure that students receive an immediate reply and have rapid confirmation of their success. Students who have difficulty with the assignment are quickly directed to the resources that they need to use to have success in the assignment. The goal of the instructor is to reply to students within three to four hours of their first assignment submission (if the assignment is submitted during regular business hours the reply is often processed in a matter of minutes).

Discovery Learning

There is no single correct method or procedure prescribed in the course. Allowing for self directed reasoning and improvising through the learning experience requires the adult learner to take full responsibility for their learning.

Throughout all course modules and course work students are given specific assignment requirements that specify what should be submitted or included in the portfolio. *Nethowto* students are also given the freedom to choose the programs they use to complete the assignments. Unlike many technology related courses that provide step-by-step instructions on conducting a specific procedure with or within an application, students are pointed to web-based resources that deal more with the general concept than with the specifics of a particular application. This is not to say that step-by-step instructions are not necessary. There is a section of each module that points to links for

the more common applications used in the course (FTP, Telnet, Text or HTML editors etc.) that do provide the step-by-steps instructions for those who are most comfortable with this form of instruction, or are not comfortable with learning by doing, experimenting or exploring.

All module coursework culminates in the course portfolio in which students have to display all they have learned in a Web site (part of the learning process is learning HTML). Students are told what is to be included in the portfolio but are not explicitly instructed on how it should be created or formatted. Instead of a rigid recipe or formula, students are given the freedom to construct their portfolio in any way they choose. Links to instructional sites on HTML, Web design, graphics utilization and usability are provided but students still required to learn how to apply the technical aspects of creating a web site to their portfolios and projects. Marking guides (details on what markers will be looking for) and examples of previous student work are provided to offer students additional guidance on what is ultimately expected. Although many students simply copy the format of previous student work, some students embrace this freedom and come up with innovative ways to display their portfolios. These innovative portfolios are often included in the examples, but unfortunately most students choose the safety of copying the simple or tried and true designs.

Modules can be Completed in any Order

Materials are designed to be read or completed in any order. Students impose their own hierarchy of knowledge, which is often born of necessity and bolstered by their previous experience. This helps to eliminate the common problems that arise from material read or completed out of sequence.

Providing a structure for openness requires a great deal of planning and structure. The course is modular and each module, except for the portfolio, which is a compilation of all other modules, can be completed in any order. The module naming conventions do not include numbers or alphabets to prevent any suggestion of a specific order. Despite the effort to not prescribe an order and even though the modules can be completed in any order, most students follow the sequential listing of assignments in the course navigation structure. This, too, is part of the design. This order has been established for those students who lack confidence or experience with technology. By following the sequence of modules, students who lack technology confidence and experience can gain enough confidence and experience from the modules to successfully complete the portfolio and final project. While this sequential ordering of the modules may appear to be a linear SI type system super-imposed on a minimalist structure, students can still do the modules out of order so the sequential ordering of the modules is not as significant as it would be in a true SI system. Due to the very divergent capabilities of students in the course, the structure of the course has to serve both students with little experience and those who may be very experienced. Students who need the order and structure can use the implied order from the navigational listing and students who have the confidence to work on course modules in their own order have the freedom and opportunity to do so as well.

It must be acknowledged that even though there is no required order for completing the modules, the portfolio does require that the other minor assignment modules be completed first. A hierarchy of knowledge for the course is imposed by the two main course assignments. In order to complete the portfolio, students must learn HTML (hypertext mark up language) and complete the other assignments. In order to

complete the final projects and earn a satisfactory grade, gaining experience in HTML development (either with a text or HTML editor) through building the portfolio is the most logical path for students to follow.

Supporting Error Recognition and Recovery

Errors must be accepted as a natural part of the learning process. Since there is such a pervasiveness of errors in most learning, it is unrealistic to imagine that errors can be ignored. Error recognition and recovery strategies need to be implemented to enable learners to learn from their mistakes instead of being trapped by them. The use of FAQ's, Help Forums and other help strategies should be implemented to deal with the errors and problems that arise.

Once again the asynchronous nature of *Nethowto* necessitates that the course itself provide support for error recovery. The Help link is strategically placed 1/3 of the way down the page and in the center (which is the area of the screen where a users eyes will first fall). The web-based conferencing system and the Help conferences are also readily available. An online FAQ and multiple admonitions to ask for help are placed strategically throughout the course.

In addition to the actual design, layout and structure of the course, the students are given immediate feedback (usually within minutes or, at most, hours) on their first assignments and also receive detailed feedback (complete with written explanations) as to what mistakes were made on their portfolios. Students are encouraged to learn from their mistakes in the portfolios and apply what they have learned to the final project. Students are given the option of submitting their portfolios three weeks prior to the end of term to receive an evaluation that will help prevent them from making the same errors on their

final project that they made on the portfolios and to give them a better of understanding of is expected in the creation of a web site.

When the students contact the instructor for help, they are first directed to the location in the course pages where the answer may lie. If the students report that they had reviewed the support material and were still not able to find a solution to their problems, they are then directed to additional support material where the answer could be found. If the additional support materials were not adequate, the students are then directed to even more information to help them determine the answer on their own. It is extremely important for the instructor to judge the level of frustration students may be experiencing and, if necessary, give them a direct answer sooner than later.

To insure that students Help needs are met, all students are regularly queried about the course Website and asked for suggestions on making changes to the course that would save them from having to contact the instructor, or use the Help forums for assistance.

Forum for Discussions and Exploiting Prior Knowledge

Adult education dealing with technology is often conducted through alternative delivery methods. Distance education, web-based instruction and other alternative delivery methods can isolate students. Providing a conferencing system for the replacement of F2F interaction is a crucial component of any alternative delivery program. Most adult learners of technology are experts in other areas or domains. Understanding the learner's prior knowledge and motivation and finding ways to utilize it is one of the keys to effective adult training. In addition, adult learners can share their

expertise or assist each other and should be encouraged to use the conferencing system to facilitate social interaction.

The WebBoard™ conferencing system is an effective forum for enabling students to provide each other with assistance. To encourage students to assist each other (not an easy thing to do in a competitive academic environment where students strive to be at the top of departmental or faculty mandated marks distributions) students are assessed a Help participation mark based on the quantity and quality of their participation—this mark is worth 10% of their final grade. One of the most common responses to the Help forums is how useful and helpful it is. It is not uncommon for a number of students in each session to state: “I could not have made it through the course without the Help forums.” In addition to help related issues, students are required to start a topic discussion on an area that they are particularly interested in. This topic discussion is also required and contributes toward the student’s Issues participation mark.

The WebBoard™ forums are an example of what Vygotsky coined as social learning. In his theory he stresses that social interaction is a critical component of situated learning because learners become involved in a "community of practice" and adopt the beliefs and behaviors of that community. Experts (experienced individuals) within the community often share the beliefs and behaviors of the community unintentionally or model the proper conduct through their behavior. Newcomers interact with the experts and then they themselves move into the community to become experts. This process can be referred to as legitimate peripheral participation and occurs unintentionally (Lave & Wenger, 1990).

Some students who admit (in the WebBoard™ forums) to being normally reserved or who might not even participate in a F2F setting are encouraged by the equality they find in the WebBoard™ environment and embrace this component of the course. It is not uncommon for these students to log on daily and to participate in most (if not all) discussions. Students who may be near completion of the course often provide encouragement to students who have joined the course late or have simply started late. This exchange of information and knowledge, and sense of community is one of the most positive aspects of this course. It is not uncommon for some students to go out of their way while traveling to find a computer to log on and continue to participate in their special virtual community.

Despite never meeting the students F2F, it was possible for me to get familiar with the students through monitoring their email and web-based conferencing communications. In one sense, it may be easier to get a better understanding of a student's personality and needs than in a F2F setting because of monitoring all their web-based communications. This advantage over the F2F setting is off set by the disadvantage of not being able to read students' non-verbal expression, body language, and general reactions.

Real World Assignments

"Make-work" (purposeless) projects are often not an effective use of a student's valuable time. All assignments must have a real world application.

All Nethowto assignments are genuine "real world" tasks that almost any information professional that uses the Internet as a tool would do on a daily basis. The Internet offers much more than the just the Web or email, and students are required to use

a variety of the Internet tools (Listserv, Usenet, Telnet, FTP, IM, HTML and Search engines) to complete their assignments which focus on the information that can be gathered, shared or moved using the assortment of Internet tools rather than focusing on the tool themselves. The goal of the course is to give students experience in communicating, accessing, and providing information on the Internet. The emphasis is on the information and not the tools used to access or provide the information. Technology is put in its place and is relegated to its rightful role as an information access tool.

Optimal Training Designs

Feedback facilities like online surveys or email should be used to allow learners to immediately provide feedback on any aspect of a program. Problems with instructions, assignments, wording or other problems should be immediately addressed and corrected. Instructional models are not deductive or prescriptive theories—they are descriptive processes. The design process should involve the actual learner through empirical analysis so that adjustment can be made to suit the learner's needs. "Develop the best pedagogy that you can. See how well you can do. Then analyze the nature of what you did that worked" (Bruner, 1960, p.89).

The *Nethowto* course has evolved to its present state because of the students who have worked through the course and provided feedback. Student feedback is immediately acknowledged, and if a particular portion of an assignment instruction (or any portion of the course for that matter) requires modification to bring clarity, this is done immediately. If the same questions are asked repeatedly, the subject of those questions is addressed and that aspect of the course is modified to provide less confusion and to improve clarity. When significant changes are made as a result of student's feedback, announcements are

made on the course News and Announcements page to insure that all students are made aware of the change. Designing and developing an effective learning environment is a dynamic process that requires immediate responses to problems that arise. Students are encouraged to fill out detailed online evaluation forms that provide additional information for continued improvements.

DELIVERY OF NETHOWTO

Because the inquisitivist approach was developed through the delivery of the *Nethowto* course, it could be argued that the inquisitivist approach is not only an effective approach for the design of web-based instruction, but it is also an effective approach for the delivery of web-based instruction.

Another factor in the delivery of *Nethowto* is that the instructor (the author) does not maintain an office on the University campus but works at a distance and uses the same Internet tools that my students are required to use. Because the system (the Internet) is not only being used by the learners to learn the system but also by the instructor to teach the system, the students are not asked or required to do anything that is not practical or that is simply not possible with the Internet. Leading or teaching by example is often one of the most effective ways to lead and to teach. When the students learn that their instructor not only “talks-the-talk” but also “walks-the-walk” and is sensitive to the genuine problems that arise with web-based instruction and communication (in the case of the instructor, telecommuting) because the instructor uses the same system that they do, attitudes toward the course and this approach to learning tends to become quite positive.

Necessity often breeds ingenuity. The evolution of the inquisitivist approach is tied so closely to the design, development and delivery of *Nethowto* that one could argue that the approach itself evolved out of necessity. The ten components of the inquisitivist approach are evident in the design and delivery of *Nethowto* (some more so than others), and while some of the components may be applied more effectively than others they all combine to provide an approach to web-based instruction that is practical and effective for the students and the instructor.

EVALUATION OF INQUISITIVISM

The evaluation of inquisitivism involved two phases and employed both quantitative and qualitative measures. In the first phase a quasi-experimental design (nonequivalent groups design) method was used to compare the grades of the final projects produced by a sample of *Nethowto* and comparison group students, and a comparison of the scores of the level of student satisfaction collected from both groups. The mark on the final project was used as a measure of student success in learning the concepts taught in the course and ultimately as a measure of the effectiveness of the instructional approach. Both the *Nethowto* sample and the comparison group involved undergraduate students enrolled in courses that had very similar content. Both the *Nethowto* and comparison group courses were designed to increase student Internet experience, knowledge and communications skills.

To determine if students in the inquisitivist based *Nethowto* course had a reduction in fear of technology, students from both the groups were asked to complete three questionnaires: Computer Anxiety Rating Scales (CARS), Computer Thoughts Survey (CTS), and General Attitudes Toward Computers Scale (GATCS) prior to the

start of the course and once again upon completion (Rosen, Sears, & Weil, 1987; Rosen & Weil, 1992).

The *Nethowto* sample differed from the comparison group comparison group in that the comparison group was required to take their course while the *Nethowto* group chose to take the course as an elective. A second difference was that 45% of the comparison group students had taken 1or 2 computer courses and the rest of the comparison group had even more formal computer training (one student had a computer certificate). In contrast, 55% of the *Nethowto* group had no formal computer training and the remaining students who did have formal computer training had taken only 1 or 2 courses. In addition, the comparison group was slightly younger (29 vs. 33), had a higher number of single students with an even lesser degree of dependence (children). Another difference noted was that over half of the comparison group did not work and the remaining portion only worked part-time. In contrast, over two thirds of the *Nethowto* group worked either full or part-time. Finally the *Nethowto* class was taught in conjunction with a graduate level class, which resulted in undergraduate and graduate student interaction.

The second phase of the evaluation included a student satisfaction analysis that was conducted over multiple sections of the the *Nethowto* course over a span of 4 years. This phase of the study also involved using the Keirsey Temperament Sorter (similar to the Myers Briggs Type Inventory) to determine for what personality type inquisitivism is more appropriate. Both aspects of this secondary evaluation were only applied to *Nethowto* students.

Academic Success Comparisons

To compare the results of the final project scores for the *Nethowto* and the comparison group, Web sites submitted by students from both groups were evaluated on the same criteria. The mark on the final project was used as a measure student success in learning the concepts taught in the course and ultimately as a measure of the effectiveness of the inquisitivist approach. Evaluators, who were "blind" to the group membership, used the same evaluation criteria given to students in both the *Nethowto* and comparison group and scored the web sites. The final project Web sites were scored out of 50 points that was based on an assessment of the project's purpose, relevance, appearance, navigation, organization, level of difficulty and content. Students were allowed to choose their own topics for the final project to insure that motivation for the projects was high. One of the goals of the final project assignment was to demonstrate that the students could take all their newly acquired Internet skills and apply what they had learned in the course through the construction of a web site. Assuming that this goal was met and that students did demonstrate what they had learned in the course, the mean score of 37 (74%) on the final projects for *Nethowto* students demonstrated that these students had learned the course content and were able to demonstrate their newly acquired abilities in the final project.

The first research hypothesis was whether students who learned the same course content via the *Nethowto* course would do better on the final project as those students who learned in a F2F model. The null hypothesis is rejected because an independent t-test (Table 1) revealed that there is a statistically significant difference between the mean final project scores for the *Nethowto* (M=37.27, SD=4.70) and comparison group course (M=28.96, SD=4.32) with the *Nethowto* students scoring higher.

Table 1. Final project scores for the *Nethowto* and comparison groups

	Nethowto (n = 54)	Control (n = 23)
Mean	37.27	28.96
Std. Deviation	4.69	4.32
Std. Error Mean	.64	.90
	t-test	
t	7.18	
df*	75	
Sig. (2 tailed)**	.003	
Mean Difference	8.21	
SE Difference	1.14	

*Equal variances
**$p < .05$

Student Satisfaction Comparisons

To assess the level of satisfaction with their learning experience between the two groups, the means of the response to "Overall, this was an excellent course" were compared. Students in both the *Nethowto* and comparison group were given an Universal Student Ratings of Instruction (USRI) evaluation (University of Alberta Computer Network Services, 2004) form that included 8 questions near the end of the course to assess the instruction they had received and to assess how satisfied they were with their learning experience. The very short instrument (8 questions), the fact that students were still actively working on the course, and the comparison group's instructor having his students fill out the questionnaire during class time resulted in a high response rates for both the *Nethowto* and comparison groups.

The course satisfaction was measured using a Likert scale with 1 being the lowest (strongly disagree) level and 5 the highest (strongly agree). Both groups indicated that they agreed that this was an excellent course: *Nethowto* student's average response to the

question was 4.24 and the comparison group student's average response to the same question was 4.13.

An independent t-test (Table 2) demonstrates that there is no statistically significant difference between the mean final project scores for the *Nethowto* (M=4.24, SD=0.82) and comparison group course (M=4.13, SD=0.81) and we therefore fail to reject the null hypothesis. The lack of significant difference indicated that even though the *Nethowto* group satisfactions scores were slightly higher, the difference was not significant enough to argue that the *Nethowto* group was more satisfied with their learning experience.

Table 2. Course satisfaction scores

	Nethowto (n = 54)	Control (n = 23)
Mean	4.24	4.13
Std. Deviation	.82	.81
Std. Error Mean	.11	.17
	t-test	
t	.54	
df*	75	
Sig. (2 tailed)**	.59	
Mean Difference	.11	
SE Difference	.20	

*Equal variances
**p < .05

Expanded Student Satisfaction Results

In addition to comparing the sample and comparison group results, the results of student evaluations of *Nethowto* undergraduate students in multiple sections of the course spanning a four year period were examined. This supplement has been included to provide a broader perspective on the student satisfaction levels of *Nethowto* students over

an extended period of time. It was also made possible because of the data collection instruments established when the course was originally set up and that were unaltered in order to collect longitudinal data for future research. The *Nethowto* course remained fundamentally the same in terms of design, content and delivery over this four year period. The changes or improvements made in the course during this time dealt primarily with issues of content clarity and also reflected responses to changes in updates in software applications and systems.

Slightly more than 36% of *Nethowto* undergraduate students from multiple sections of *Nethowto* filled out a post course questionnaire over a four year period resulting in sample size of 258 for this analysis resulting in an n of 258 for this analysis. The following 6 responses (Table 3) were selected and analyzed from the questionnaire because these questions dealt specifically with aspects of student satisfaction. More specifically, the questions dealt with student perceptions on the amount they learned in the course, how satisfied they were with the inquisitivist approach and if they found the approach effective.

The responses represent a Likert scale, with 1 being the lowest level (strongly disagree) and 5 the highest (strongly agree). While the students found they learned a lot in the *Nethowto* course they were not as positive with respect to the format and structure in which the course was delivered. Students either agreed or strongly agreed that they learned a lot, would be willing to take similar courses online and perhaps most importantly, agreed that the course helped them to significantly grow in their knowledge of computers and Internet, but they did not agree that the structure was conducive to learning. In addition, a SD of 1.17 on a mean of 2.28 indicated that even though on

average the student responses were close to neutral or leaned slightly toward disagreeing that they would have preferred to take the course via a traditional lecture/lab format, there was still a significant proportion of students that would have preferred to take the course via a traditional lecture/lab format. This observation is similar to the results of Goodwin, Miller and Cheetham (1991) and Lake (2001). Their research confirmed that students subjected to active learning instruction would have preferred the more traditional lecture format despite having achieved greater success.

Table 3. Student responses to questions about their satisfaction

Student Response	Mean	SD	n
I learned a lot in this course	4.34	.87	258
I found the structure of the course conducive to learning.	3.85	.99	258
I would take other courses offered in this online, individualized instruction manner.	4.05	1.04	258
This course helped me grow from one level of knowledge about and familiarity with computers and the Internet to a significantly higher level.	4.36	.79	258
I found the Learning Theory (Inquisitivism) used in this course to be effective for this type of instruction.	3.90	.91	258
I would have preferred to take this course via a traditional 'Lecture/Laboratory' mode.	2.28	1.17	258

Reduction of Fear

The original study design included an analysis of the comparison and *Nethowto* groups but because only 4 of the 23 comparison group students who completed the pretest surveys completed the posttest surveys, a comparison between the comparison group and the *Nethowto* was not possible. While the response rate from the *Nethowto* course was higher only 11 out of 54 (20%) students completed the posttest anxiety surveys and 10 of 54 completed the posttest thoughts and attitude surveys. The poor response rates of these posttest surveys negated any statistically useful data.

In response to this development additional data were used to determine if there had been a change in anxiety or fear for *Nethowto* students as a result of the inquisitivist approach in a larger sample. Since the CARS, CTS and GATCS questionnaires, which were established when the course was originally set up, were left in place in order to collect longitudinal data, undergraduate *Nethowto* students from multiple sessions over a four year period were included in this analysis. Of the 479 undergraduate students who completed the *Nethowto* course during this expanded time frame, 162 students completed the posttest anxiety questionnaire, 168 completed the posttest thoughts questionnaire and 170 students completed the posttest attitude questionnaire.

The increase in the response rate of 33% of the extended sample compared to 20% in the original *Nethowto* sample could be attributed to students being sent an additional reminder with their final project evaluations to complete the posttest questionnaires and to an additional reminder being posted on the course conferencing system.

The anxiety levels are represented by a Likert scale with 1 (Not At All) being the lowest level and 5 (Very Much) the highest. The attitudes toward computers are represented in a Likert scale, with 1 (Strongly Disagree) being the lowest level and 5 (Strongly Agree) the highest. The thoughts about using computer levels are represented by a Likert scale with 1 (Not At All) being the lowest level and 5 (Very Much) the highest. Questions about thoughts and attitudes towards computers were included in two of the three surveys to help isolate the question regarding anxiety toward technology and prevent any overlap in student responses.

Table 4 provides the mean scores for pretest and posttest attitudes and thoughts, which are virtually identical while there is a difference between the pre and posttest anxiety scores.

Table 4. Means scores and standard deviations associated with pre and posttest anxiety, attitudes and thoughts about computers

Test		Mean	SD	N
Anxiety	Pre-test	1.76	.64	162
	Post-test	1.28	.57	162
Attitude	Pre-test	3.13	.39	170
	Post-test	3.14	.35	170
Thoughts	Pre-test	2.83	.39	168
	Post-test	2.87	.37	168

Table 5 provides ANOVA results. This analysis provides evidence of a statistically significant reduction in posttest anxiety scores ($p \leq .01$) in the expanded sample. A repeated dependent t-test would have yielded the same result as a Repeated Measures ANOVA of the means and could have been used, but an ANOVA was used because it reduces the chance of multiple test error and reduces Type 1 error. There was no significant difference in the pre and posttest scores for attitude and thoughts toward technology.

Table 5. Sources of variance in pre and post test anxiety, attitudes and thoughts about computers

Variance Source	df	MS	F	p
Pre vs. Posttest Anxiety	1	2.07	14.01	.004*
Within cells error	161	.15		
Pre vs. Post test Attitudes	1	3.43	.11	NS
Within cells error	169	.25		
Pre vs. Post test Thoughts	1	1.01	.13	NS
Within cells error	167	.22		

*$p < .05$

While the hypothesis that students in the inquisitivist based *Nethowto* course had a reduction in fear of technology is supported in the expanded sample due to the anxiety

findings this result has to be viewed in the context of there being no significant difference in the level of fear of technology in the original sample group.

Personality Type Suitability

To determine if inquisitivism is appropriate for all personality types, *Nethowto* students from multiple sections of *Nethowto* were asked at the beginning of the course to complete the Keirsey Temperament Sorter (KTS) II (similar to the Myers Briggs Type Inventory). Temperament type was used as a factor in an ANOVA.

Table 6 includes the *Nethowto* student final project mean scores and the standard deviations for each personality type.

Table 6. Mean scores and standard deviations of personality types of *Nethowto* students

Personality Type		n	Mean	SD
	Guardian	40	35.03	3.548
	Artisan	147	34.43	4.398
	Idealist	53	34.15	5.379
	Rational	133	34.52	4.403
Total		373	34.49	4.459

Notice the similarity of mean values in the personality types. While there were significantly more Artisan (147) and Rational (133) than Idealist (53) and Guardian (40) personality types, there is very little difference in the final project mean scores. An analysis of variance showed that no significant difference exists among the mean scores of the final project for the students with the four different personality types: ($F(3/369) = .303$, $p = .823$) and have therefore failed to reject the null hypothesis.

These results indicate that since students from all four personality types scored equally on the final project the inquisitivist approach would be suitable for all four personality types tested. Or, more specifically, the inquisitivist based *Nethowto* course may enable students from the four personality types to score well in their assignments.

Not only did this study show that the online students did better on their final projects than the F2F students, it also showed that there are was no significant difference in the levels of learning experience satisfaction between the online students and the students in the traditional F2F classroom. It has also been shown that there was a reduction in student anxiety and the achievement with the inquisitivist approach did not differ (in terms of final project performance) for the four personality types measured by the Keirsey Temperament Sorter.

NETHOWTO STUDENTS EXCEEDED EXPECTATIONS.

The significantly higher final project scores from the online (*Nethowto*) students can be corroborated by a recent meta-analysis of distance learning research (Allen, et al., 2001; Allen, Bourhis, Burrell,& Mabry, 2002). The mean scores of the *Nethowto* students' final projects were 17% higher than the comparison group. This difference is especially surprising given the fact that, on average, the comparison group students had taken more computer courses and had less work and personal responsibilities.

The difference in scores between the *Nethowto* and comparison groups could have been attributed to a variety of factors. It may be the case that the *Nethowto* students motivation to do well in the course was higher because the *Nethowto* group chose the course as an elective while the comparison group was required to take their course.

Another factor affecting motivation could be related to the fact the *Nethowto* group was more mature, had greater martial and family responsibility and could have been more accustomed to project work and independent learning.

Perhaps one of the most significant factors is time on task, which is a factor often not effectively controlled in quasi-experimental designs of educational research (Joy & Garcia, 2000). By its very design, inquisitivist instruction requires students to use the system while they learn the system. This translates into the *Nethowto* students spending virtually all their time on the actual task of learning to communicate, access, and provide information on the Internet.

In contrast, the comparison group students had traditional lectures, which meant that even though they could have been listening to Internet related topics, or even discussing these topics, they were not actually working on tasks relevant to learning how to use the Internet. Similarly, the time spent in labs for the comparison group also may not have been considered to be productive time on task due to the systematic design of the comparison group course. With this design, students worked through lab assignments that followed the traditional step-by-step format. While this type of recipe learning does allow students to successfully complete assignments, it may not effectively foster knowledge acquisition, as minimalism would suggest.

This situation has been evident in the delivery of *Nethowto*. Some education students, who come into the *Nethowto* course and having completed a prerequisite course that uses the traditional systematic approach often have problems transferring or applying their experiences from the previous course to almost identical assignments in *Nethowto*. The only difference in the assignments is that *Nethowto* assignments do not follow the

systematic recipe and they allow the student to choose the program they should use to complete the assignment. While it must be acknowledged that this data is anecdotal the incidents where this situation has happened have occurred enough times to warrant reporting and consideration for further investigation.

Another contributing factor that may explain the higher success of *Nethowto* students is that there could be significantly more direct instructor-student interaction. Direct interactions with the *Nethowto* instructor fall either into the category of email, web-based messages replies or telephone conversations. Since *Nethowto* is conducted completely online, tracking the email and web-based conferencing interactions is very simple. On average, *Nethowto* students have 31 direct interactions with their instructor per session (academic term). The direct responses to student questions in the web-based conferencing system have the advantage of being available and accessible for all other students to view at any time. Unfortunately, instructor involvement or interaction was not tested in the study, but one can assume that the number of direct interactions were much higher in the online course than they were in the F2F course.

Yet another possible success factor for the *Nethowto* students that was not controlled or tested was the collaborative aspect of the inquisitivist approach. *Nethowto* students were required to participate in a Help forum and 10% of their final mark was also derived from this participation. Another 10% of their final mark was derived from the Issues conference participation where students were required to start and moderate an issue of their choosing and were required to participate in issues discussions with other students. In total, 20% of *Nethowto* students' final marks were from web-based conferencing participation, so motivation to participate was quite high. While this was

not controlled for and not tested, it may be speculated that the help and issues participation contributed significantly to the *Nethowto* students' acquisition of knowledge and final project success. Vygotsky (1978), and similar social constructivist theorists, stress the significance of social learning and the transfer of knowledge and expertise through social interactions; therefore, it can be speculated that this dynamic applied.

A final contributing factor to the *Nethowto* students' success could be their involvement with graduate students in the conferencing component of the course. Since the undergraduate and graduate *Nethowto* students participated in the same conferencing forum it may be the case that the graduate students attitude toward learning could have positively affected the undergraduate students.

While the author would like to posit that the inquisitivist approach was primarily responsible for the *Nethowto* student success, the aforementioned speculated factors need to be tested in further research. Regardless of the reason for their actual success, *Nethowto* students appeared to have learned the course material and also appeared to be satisfied with their learning experience.

NETHOWTO AND F2F STUDENTS LEARNING EXPERIENCE SATISFACTION

Evidence showed that there was no significant difference in the learning experience satisfaction between *Nethowto* students and the comparison group students. The differences between the *Nethowto* and comparison group satisfaction mean scores were slight, with the mean scores for the *Nethowto* group being slightly but not statistically significantly higher. In addition to students being satisfied, it can be shown that *Nethowto* students believed that they learned a lot and that their knowledge grew

significantly. The evidence from the supplemental questionnaire given to the *Nethowto* students suggests that the students not only learned a lot, they agreed that the course helped them to grow from one level of knowledge and familiarity with computers and the Internet to a significantly higher level.

The only question that did not have a clearly positive response was the question of whether or not students would have preferred to take the course via a traditional lecture/laboratory mode. Even though on average the student responses were close to neutral or leaned toward disagreeing that they would have preferred to take the course via a traditional lecture/lab format, there was still a significant proportion of students that agreed and would have preferred to take the course via a traditional lecture/lab format. Similarly, the average student response which was slightly more positive than neutral toward the online format the wide spread, indicated by a large standard deviation (1.17), suggests that significant numbers of students that would have preferred the traditional format. The slightly positive leaning toward the online format may be accounted for by the fact that approximately half the students in the course were true-distance students and had no choice in the format of their instruction or were accustomed to the online format. In contrast, approximately half the students in the course were non-distance students accustomed to attending traditional classes on campus. The students who indicated a preference toward the traditional lecture/lab format may have done so because they were accustomed to this form of instruction or they simply found traditional instruction easier and were more comfortable following a recipe. It may also just be the case that students simply do not like active learning. These factors could be taken into account in further research.

OVERCOMING INQUISITIVIST APPROACH CHALLENGES

Even though the data reveals that students in the *Nethowto* course performed very well in their final projects, were as satisfied with their instruction as the comparison group, and it appears the inquisitivism is suitable for the four measured personality types, there are still challenges to the approach. For example, one of the most interesting paradoxical situations is that too many questions are asked by students how have simply not even read any of the instructions, and at the same time, not enough questions are asked students who are looking for the hidden challenge to the course. Another paradox involves encouraging student participation in the course conferencing system while at the same time limiting excessive participation and competition. One of the most perplexing challenges is addressing the unique instructional needs of the vast diversity of students who take the course. Rather than view these issues as obstacles, these issues should be, and are, viewed as opportunities to make improvements in the design and delivery of *Nethowto*. Addressing these challenges and many other challenges that have arisen in the development and delivery of Nethowto will be addressed in future publications.

FURTHER RESEARCH AND CONCLUSIONS

Since the inquisitivist approach is new and an adaptation of minimalism, it could be argued that studies need to be run again (perhaps numerous times) but with much greater controls. Future investigations into the effectiveness of the inquisitivist approach would have to:

- Employ true random sampling and statistically meaningful samples.

- Control for prior knowledge, ability, learning style, teacher effects, time-on-task, instructional method and media familiarity.
- Use a comparison group for all aspects (i.e. personality).
- Use instruments with sufficient number of items to increase reliability.
- Establish reliability scores on final projects.
- Consider using continuous data rather than discontinuous (i.e. use personality scores rather than 4-point scales.

However, even if these independent variables could be effectively controlled, their application would be artificial, calling to question the whole media comparison (Joy & Garcia, 2000).

Future research could also investigate the role of time-on-task, the impact of instructor-student and student-student interactions and the effect of graduate and undergraduate student interactions. The affect of the instructor's personality and teaching style on the implementation and delivery of the Nethowto model could also be investigated. An even more perplexing area of future research would deal with the question of why students who demonstrated a high level of success and satisfaction with the inquisitivist approach would still have preferred a traditional form of instruction. Carroll found a similar phenomenon in his research that revealed that despite the success with minimalist documentation, people still claimed to prefer the traditional documentation (1990). Goodwin, Miller and Cheetham (1991), and Lake (2001) also found that despite demonstrable improvement in achievement levels over lecture based

instruction, most students perceived active learning instruction to be ineffective and would have preferred lecture-based instruction.

Are these claimed preferences actual preferences or simply people's natural tendency or desire to preserve the status quo? Or does the inquisitivist approach and similar active learning approaches expect or require too much of the learner? Are classes easier in the traditional systematic design format? Are inquisitivism, minimalism, active learning and many other student centered constructivist approaches really such hard work, or are students simply more comfortable with memorization than with learning how to think? These questions are just the beginning of many more questions that would need to be effectively explored to determine why people appear to still prefer systematic design instruction despite demonstrable success with other instructional approaches like inquisitivism.

Inquisitivism, minimalism, and active learning can be hard work especially for those who are not accustomed to this form of instruction. Similarly, memorization is much easier than learning how to think critically and analytically if one is accustomed to memorization. We clearly need to change student's experience and perceptions towards these forms of instruction. Lake (2001) suggested that we expand the discussion for the rational of active learning methods, incrementally introduce active learning and, finally, change to an all active learning curriculum. I agree with Lake, but would add that we need to move toward a much broader adoption of inquisitivist, minimalist and other forms of constructivist approaches at the primary and secondary levels so that when students reach the post secondary level they are accustomed to the challenges and benefits of these active and engaging forms of instruction.

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