Proposal for the Research, Scholarship, and Creativity Grant (2010 – 2011)
Dr. Daniel C. Moos, Department of Education, Gustavus Adolphus College

APPLICATION CHECKLIST
Research, Scholarship, and Creativity Grant

Deadline February 12th 2010 (or following Monday if a weekend)

Please print and complete this checklist and attach it as the cover page of your grant application.
For more information about RSC grants, please see
http://gustavus.edu/facdev/GrantOpportunities/RSCGrant.php

Faculty information

Name: Daniel C. Moos   Dept: Education

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Checklist

X Description of previous projects (and outcomes) funded by RSC grants

X Complete project description, including separate statements of:

1. **Purpose.** What are the intellectual, conceptual, or artistic issues? How does your work fit into other endeavors being done in this field?

2. **Feasibility.** What qualifications do you bring to this project? What have you done/will you do to prepare for this project? What is the time period, i.e. summer, summer and academic year, academic year only? Is the work's scope commensurate with the time period of the project?

3. **Project Design.** This should include a specific description of the project design and activities, including location, staff, schedules or itineraries, and desired outcomes.

X RSC Budget Proposal Form attached as last page of application

X Nine (9) copies of completed application and budget (including this checklist) to be submitted to the John S. Kendall Center for Engaged Learning (SSC 119)

If successful, my proposal can be used as an example to assist future faculty applications. This decision will not in any way influence the evaluation of my application.   (Yes) No   (please circle one)

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BUDGET PROPOSAL FORM
Research, Scholarship, and Creativity Grant

ITEM		AMOUNT
Equipment (not to include computer hardware)		**$250**
1: Microcassette Transcriber ($250)	Cost:	
2:	Cost:	
3:	Cost:	
Materials		**$180**
1: Microcassette Tapes ($120; predicting 60 participants, which would require 60 microcassettes. The cost of one microcassette is roughly $2)	Cost:	
2: Microcassette recorder ($40)	Cost:	
3: Manila Folders ($20)	Cost:	
Personnel: (check the faculty book white pages for recommended rates)		**$**
1:		
2:		
Travel Costs		**$**
Airfare:		
Mileage: Number of miles_____ @ $0.505/mile		
Lodging		**$**
Number of days_____ @ $_____ /day		
Other Expenses: (check the faculty book white pages for excluded items)		**$**
1:	Cost:	
2:	Cost:	
3:	Cost:	
Faculty Stipend ($500 professor; $600 associate professor; $700 assistant professor)		**$700**
TOTAL EXPENSES		**$1,130**
AMOUNT REQUESTED (not to exceed $1500 + stipend commensurate with rank)		**$1,130**

Have you applied for, or received funding from, another source to help support this project? **NO**
Funding Source:

Proposal for the Research, Scholarship, and Creativity Grant (2010 – 2011)
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Amount: Please explain how the RSC will be used in addition to the other funding.

Project Title: Judgment of learning: Using think-aloud protocols to examine its effect on learning with hypermedia

Purpose. What are the intellectual, conceptual, or artistic issues? How does your work fit into other endeavors being done in this field?

This proposal was designed to support an empirical study that is the next natural step in my research agenda. In essence, my research examines a myriad of factors that explain how students process information with computer-based learning environment (CBLEs). Sample questions guiding my research agenda include: How do students self-regulate their learning with CBLEs? How is motivation related to the use of these processes? How does the design of the CBLE affect the learning process? The following section will briefly describe this research agenda and the methodology I use. Following this description, the purpose of this proposal will be articulated, which will include a description of how this proposal fits into the research of others in the fields of educational psychology, cognitive psychology, and instructional technology.

Recently, research has examined processes related to learning with computer-based learning environments (CBLEs), such as hypermedia. Hypermedia, which can contain textual information, static diagrams, audio, and digitized video clips, provides visually rich and interactive learning environment. In order to effectively navigate and learn in this flexible, nonlinear learning environment, students need to use certain processes related to self-regulated learning (Azevedo, Guthrie, & Seibert, 2004a; Azevedo, Winters, & Moos, 2004c; Moos, 2006, 2007, 2008, 2009; Moos & Azevedo, 2006, 2008a, b, c; Moos & Marroqun, in press). In particular, this line of research has identified the importance of specific SRL processes related to metacognition, such as judgment of learning. As such, this line of research has used self-

regulated learning (SRL) theory (Pintrich, 2000; Winne 2001; Winne & Hadwin, 1998;

Zimmerman, 2001) to examine how judgment of learning affects use of hypermedia.

SRL is a complex theory that has evolved over the last 30 years. The earlier views of self-

regulated learning (SRL) focused on isolated learning, while approaches to SRL in the 1980s

presented more comprehensive and multifaceted models. These SRL models offered a

perspective that viewed students as proactive and strategic learners, as opposed to passive

learners in their environment. To explain this proactive, strategic orientation, researchers

appealed to social, behavioral, motivational, and cognitive variables in several instructional

contexts. These SRL models have evolved over the last twenty years, driven in part by the

considerable research examining SRL in academic achievement (see Boekaerts, Pintrich, &

Zeidner, 2000; Zimmerman & Schunk, 2001). Recently, research has used SRL theory to

examine how students learn with CBLEs, such as hypermedia environments (Azevedo, 2005;

Azevedo & Hadwin, 2005; Graesser, McNamara, & VanLehn, 2005; Lajoie & Azevedo, 2006;

Quintana, Zhang, & Krajcik, 2005; White & Fredriksen, 2005). However, there has been recent a

movement to carefully consider how to best measure SRL.

When designing a methodology to measure *when* students self-regulate their learning

with hypermedia, it is necessary to account for the properties of SRL. Winne (1997) and Winne

and Perry (2000) proposed that SRL can be viewed as having one of two properties, *aptitude* or

event. Orientation to either of these properties determines, in part, the methodology used to

examine SRL. For example, an aptitude is a relatively enduring trait of an individual, and

measurement of this trait can be used to predict future behavior. Furthermore, when SRL is

considered an aptitude, it is assumed that a single measurement aggregates a quality of SRL

based on multiple events (Winne & Perry, 2000). This assumption suggests an individual's self-

perception of his or her metacognitive and/or cognitive processes is an accurate measurement of

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SRL. These perceptions often are derived from responses to questionnaires, with self-report questionnaires being the most frequently used protocol for measuring SRL as an aptitude (Winne & Perry, 2000).

On the other hand, self-regulation as an event suggests that SRL unfolds within particular contexts (Boekaerts et al., 2000). Perry, VandeKamp, and Mercer (2002) suggested that self-regulatory processes should be examined in *real* time because SRL is an ongoing process that unfolds within particular contexts. Thus, protocols that measure SRL as an event are designed to capture the dynamic nature of SRL and are typically based on an information-processing model of SRL (i.e. Winne, 2001; Winne & Hadwin, 1998). Some recent research has strongly advocated viewing SRL as an event (e.g., Azevedo & Cromley, 2004; Moos & Azevedo, 2006; Witherspoon et al., 2007), and that SRL data collected *during* learning is a more accurate measurement of processes related to SRL (Azevedo, 2005; Perry, 1998; Winne, 2005; Winne & Perry, 2000; Winne & Jamieson-Noel, 2003).

The think aloud protocol offers a process methodology that measures cognitive and metacognitive SRL processes during learning (Azevedo, 2005). The think aloud protocol has been most popular in reading comprehension (see Pressley & Afflerbach, 1995) and has been shown to be a powerful tool in gathering verbal accounts of SRL and mapping out these processes during learning (Chi, Glaser, & Farr, 1988; Ericsson, 2006; Ericsson & Smith, 1991; Azevedo et al., 2005; Moos & Azevedo, 2006; Witherspoon et al., 2007). The think aloud has an extensive history in cognitive psychology and cognitive science (see Ericsson, 2006; Ericsson & Simon, 1994; Feltovich, Ford, & Hoffman, 1997; Newell & Simon, 1972 for an extensive review) in which both concurrent and retrospective think aloud protocols have been used as data sources for cognitive and metacognitive processes (Anderson, 1987). Concurrent think-alouds assume that thought processes are a sequence of states, and that information in a state is

relatively stable (Ericsson & Simon, 1994). Consequently, verbalizing thoughts during learning will not disrupt the learning process. However, it is important, "that subjects verbalizing their thoughts while performing a task do *not* describe or explain what they are doing (Ericsson & Simon, 1994, pg. xiii)." If subjects are not asked to reflect, describe, and/or explain their thoughts during learning, but rather are asked to simply verbalize thoughts entering their attention, then it is assumed that the sequence of thoughts will not be disrupted. Empirical evidence has supported this assertion. For example, Deffner (1989), Heydemann (1986), and Rhenius and Heydemann (1984) all found that the think aloud protocol was not related to significant changes in cognitive processes, as reflected in the performance of participants in these studies.

Despite the recent push to use process data (e.g., think-aloud protocol) to capture SRL processes during learning, there is still limited empirical research that has employed this methodology. This proposal for the Research, Scholarship, & Creativity grant is intended to support a empirical study that furthers the field by using a think-aloud protocol to examine undergraduates' use of SRL processes (specifically their judgment of learning). This study would align with the work of some of the top researchers in the field, including Drs. Azevedo (utilizing think-aloud protocols), Winne (SRL with CBLEs), and Veenman (the role of metacognition in learning). Furthermore, it is of my opinion that this study has the potential to make significant contributions to the field as there is relatively limited research that has used think-aloud protocols to examine SRL during learning. Equally important, however, will be the benefit of this study for my teaching in EDU 330: Educational Psychology. Metacognition is a primary topic for this class and "judgment of learning" is a key processes related to metacognition. As such, this study would allow me to supplement our discussion with data from my research.

Feasibility. What qualifications do you bring to this project? What have you done/will you do to prepare for this project? What is the time period, i.e. summer, summer and academic year, academic year only? Is the work's scope commensurate with the time period of the project?

Qualifications
- Ph.D. in Educational Psychology and MA in Human Development
- Six years of research related to self-regulated learning with CBLEs
- This line of research has led to 15 publications in peer-reviewed journals, all of which report findings from research that used the think-aloud protocol
- This research has also led to 37 international and national presentations, most of which have report findings from research that used the think-aloud protocol. Most recently, I presented this research in Spain in Amsterdam.

Preparation
While I have received extensive training in using think-aloud protocols, and have gained expertise in the required statistical procedures, I will need to conduct various literature reviews this summer. These literature reviewers will focus on technology in the classroom and metacognition (specifically judgment of learning). I am confident of my ability to conduct these literature reviews as I just had two literature reviews recently accepted in top-tier peer review journals, *Review of Educational Research* (Moos & Azevedo, 2009) and *Computers in Human Behavior* (Moos & Marroquin, in press).These literature reviews are also directly related to content in two of the classes I teach here at Gustavus, *Educational Technology* and *Educational Psychology*. As such, I envision these literature reviews strengthening my preparation for teaching these courses in the Fall 2009 semester.

Time Period
Summer 2010: Conduct relevant literature reviews and finalize methodology for study
Fall 2010 – Spring 2011 (February): Collect data
April 2011: Analyze data
May 2011: Submit findings to an international conference, possibly *American Educational Research Association.*

This Time Period model is one I have adopted over the last six years and seems to work well for creating a yearly cycle. This model allows me to have research in various stages at virtually all points during the year, particularly because peer-reviewed journals have varying delays for their

decisions. As an example, I am currently collecting data for one study, have one paper in press,

and have three papers under review.

Project Design. This should include a specific description of the project design and activities, including location, staff, schedules or itineraries, and desired outcomes.

The pertinent information is listed below. Please note that this study will be run in my office,

where I currently have a table set up with a laptop computer, tape recorder, and note-taking

station. I am currently using this set-up to complete a study with a similar procedure.

Participants. Participants would include 60 students. My plan is to first recruit the

students from our Education department. Over the last couple of years, I have successfully

recruited participants from the Education department.

Measures. The measures for this study will include *prior knowledge (with judgment of*

learning measures), learning outcomes, self-efficacy, and use of *SRL processes.* The content for

this study will be the circulatory system and, as such, a pretest and posttest on the circulatory

system will be used to measure participants' learning outcomes. The pretest and posttest are

identical, and I have used this test in previous research (Moos 2006, 2007, 2008). The pretest and

posttest are both comprised of an essay, which measure the participants' mental model of the

circulatory system. The scoring scheme for this essay ranges from 1 to 12, and represents a

transition from a low to a high mental model of the circulatory system. Additionally, these essays

will include items that ask the participants to make judgments of their learning.

A modified self-efficacy scale from the Motivated for Strategies Learning Questionnaire

(MSLQ; Pintrich et al., 1991) will be used to measure participants' *self-efficacy.* The self-

efficacy scale from the MSLQ includes eight task and context specific questions regarding self-

efficacy. The wording of these eight questions will be slightly modified in this study to ensure

that the questions are specific to the learning task. For example, the question, "I believe I will receive an excellent grade in this course" will be modified to, "I believe I will receive an excellent posttest score after learning about the circulatory system with this computer program." Each question is answered on a seven point Likert scale (1 = not at all true of me, 7 = very true of me).

Lastly, participants' use of *SRL processes* will be measured with a think-aloud protocol (Ericsson, 2006; Ericsson & Simon, 1994). In order to code participants' use of SRL processes, as gathered by the think-aloud protocol, modified codes developed by Azevedo, Cromley, and Seibert (2004) will be used. Their model was based on several recent models of SRL (Pintrich, 2000; Winne, 2001; Winne & Perry, 2000; Winne & Hadwin, 1998; Zimmerman, 2000, 2001). The modified coding scheme includes 27 SRL processes from the three SRL categories of *planning, monitoring,* and *strategy use.*

Procedure. The procedure, which will be identical for all participants, will include six steps. First, each participant will be given 15 minutes to complete the pretest (following the signing of the consent form). Second, the participant will be provided a walkthrough of the learning environment. The learning environment for this study is hypermedia, and the participants will be shown how to navigate and use other search functions during the walkthrough. Third, the participant will be provided with the directions of the learning task. Fourth, the participant will complete the self-efficacy scale from the MSLQ. Fifth, the participant will begin the 30-minute learning task. The participants again will complete the self-efficacy scale at two points during the learning task (10 and 20 minutes into the learning task). This methodological approach will allow me to measure the fluctuation of self-efficacy during learning (as it relates to their judgment of learning). Sixth, the participant will be given 15 minutes to complete the posttest.