Proposal for the Research, Scholarship, and Creativity Grant (2013 - 2014)
Dr. Daniel C. Moos, Department of Education, Gustavus Adolphus College

Research, Scholarship, and Creativity Grant

Deadline Monday, February 11th

Please complete this checklist and attach it as the cover page of your grant application, whether you submit electronically or via hard copy.

Faculty Information

Name: Daniel Moos

Dept: Education

Email: dmoos@gustavus.edu

Rank: Associate Professor (as of Fall 2013)

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

X 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. Check box to give permission.

Proposal for the Research, Scholarship, and Creativity Grant (2013 - 2014)
Dr. Daniel C. Moos, Department of Education, Gustavus Adolphus College

Budget information

NAME __Daniel Moos

STIPEND (Please check one box to indicate your distribution preference)
*Note: The RSC grant will fund up to 1,500 towards **Project Costs.** If your project costs will exceed this amount, you may opt to apply a portion (or all) of your stipend to cover these additional costs. If this option is your preference, please select "Partial Amount".*

$600 Full Amount ($600-associate professor, as of Fall 2013)

Partial Amount (apply a portion of the full amount to project costs)

Partial Amount: Please indicate the amount that you would like to apply towards project costs ($ _____) and the remaining stipend after this deduction ($ _____)

PROJECT COSTS: List each item individually with its cost. Attach additional sheets if necessary.	**Project Costs Amount**
I. Equipment (e.g. transcription machine, camera, digital recorder—but not computer hardware)	***I. Equipment***
1. Transcription machine	1. 500
2. Microcassette recorder	2. 60
3.	3.
II. Materials (e.g. books, printing, software, lab supplies)	***II. Materials***
1. Microcassette Tapes for 60 participants	1. 120
2. : Manila Folders	2. 20
3.	3.
III. Personnel (e.g. typist, transcriptionist, student assistant)	***III. Personnel***
1.	1.
2.	2.
3._____	3.
IV. Travel (cannot include conference travel, see http://gustavus.edu/finance/travel.php for allowable expenses)	***IV. Travel***
1.	1.
2.	2.
3.	3.

TOTAL PROJECT COSTS **$__700_____**

TOTAL AMOUNT REQUESTED (Total Project Costs + Stipend)
$___$1300_____
(Note: The RSC grant will fund up to an amount equal to your Full Stipend + 1,500 for Project Costs)

2013 RSC Grant Application
Daniel C. Moos (Education)
Project Title: *Self-regulated learning and Epistemological beliefs: A predictor of learning?*

Description of previous projects funded by RSC grants

2010 – 2011: I received funding through the Research, Scholarship, and Creativity Grant to support an empirical study that was the next natural step in my research agenda during the 2010 – 2011 academic year. In essence, my research examines a myriad of factors that explain how students process information with computer-based learning environment (CBLEs). Sample questions 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? This grant supported an empirical study that employed a think-aloud protocol to examine undergraduates' use of SRL processes (specifically their judgment of learning) with hypermedia, an open-ended and nonlinear technology environment. I presented findings from this study at one of the top international conferences in my field, the American Educational Research Association (AERA).

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

Imagine a student who is provided with a multimedia rich, nonlinear technology environment and asked to learn about a complex topic such as the circulatory system. This environment offers the opportunity to use a number of learning tools, such as text and corresponding detailed images of the heart, as well as interactive videos explaining the path of blood through the circulatory system. The student can choose an instructional path that best meets his or her learning needs, quickly navigating between various sources of information based on his or her evolving knowledge state of the circulatory system. Conversely, the student may choose to engage the environment in a linear fashion, using the multimedia tools in a sequential order much like processing information from a book. Such individual differences in the learning process exist, with some students becoming active participants in the learning process while others assuming a much more passive role in learning. The latest technology magnifies the effect of the learning process by requiring students to engage in self-regulated learning. For example, multimedia environments necessitate the use strategies, such as coordinating the multiple informational sources found in the environment. Furthermore, the student should assess the extent to which the strategies are effectively facilitating progress towards the desired learning goal. The student should also regularly monitor his or her emerging understanding and relevancy of content, processes that allow for adaptive adjustment in both the choice of learning strategies and the identification of the optimal navigational path. While these self-regulatory processes are critical in facilitating learning within multimedia rich, nonlinear technology environments, students of all developmental groups may not use them. Why is it that some students create sub-goals, use effective strategies, monitor their emerging understanding, and adapt their approach to learning with these environments, while others use these processes less frequently, if at all? To complicate matters, the use of these processes is a necessary but insufficient component to successful learning with these environments. Students must also *accurately* use these processes.

These issues have been the focus of my research over the last ten years. I have used a think-aloud protocol to examine how the design features of the latest technology environments affect learning, and how students engage in self-regulated learning (SRL) within these

environments. Genrally speaking, each experimental session involves individually running participants while they complete various self-report and knowledge measures, and then are asked to "think aloud" as they learn about a complex topic (such as the circulatory). Their thinking aloud is audio recorded and later transcribed. As such, a transcription machine is critical to my research. The transcription is then coded to examine how each participant used specific self-regulatory process (see Appendix A).

My research agenda includes examining constructs that explain individual differences with respect to self-regulated learning, such as motivation and prior domain knowledge. Within the last two years, I have increased my attention on personal beliefs and their impact on the learning process. The field of epistemology, for example, offers a theoretical framework to explain how personal beliefs related to knowledge affect one's learning. Originally describing the understanding of knowledge as a progression from dualistic to relativist thinking (Perry, 1970), the field of epistemology has evolved and models have emerged suggesting that epistemology is composed of distinct dimensions (e.g., Bendixen & Rule, 2004; Buehl & Alexander, 2006; Greene, 2009; Greene, Torney-Purta, & Azevedo, 2010). For example, Schommer (1990, 1993a,b) advocated the following five dimensions: Omniscient Authority, Certain Knowledge, Simple Knowledge, Quick Learning, and Innate Ability. Presumably, views along these different dimensions will affect the learning process. For example, assume a student has a naïve view of omniscient authority; this personal belief may lead to the inaccurate assumption that the accuracy and relevancy of information within the latest technology does **not** need to be evaluated. The relationship between personal beliefs and self-regulated learning is an emerging area of research and I am excited about the potential to contribute to this new field. This RSC grant would allow me to conduct a study that examines the complex relationships between personal beliefs and self-regulated learning by providing the funds to replace my current transcription machine, which no longer functions properly.

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

- 26 publications in internationally peer-reviewed journals, most of which report findings from research that used the think-aloud protocol and focused on SRL
- 41 international and national conference presentations, most of which report findings from research that used the think-aloud protocol and focused on SRL
- Ten years of research related to self-regulated learning (SRL)
- Member of Editorial Board for two internationally peer review journals
- Ph.D. in Educational Psychology and MA in Human Development; 6 years as a Research Assistant in the Cognition and Technology Lab (University of Maryland)

Preparation

The study for this RSC will utilize a think-aloud protocol, a methodological approach rooted in cognitive psychology. It has been shown to be a valid and reliable measure to collect

data on how individuals process information during a learning task. I received extensive training in using think-aloud protocols, and have gained expertise over the last 10 years in using the required statistical procedures associated with this protocol. A transcription machine and recorder are necessary for this methodological approach. I need to replace my current machine as it no longer functions properly. Funds from this RSC grant would support this replacement.

Additionally, the vast majority of my 26 published articles have used the measures identified in this RSC application (self-report measures and knowledge measures). Thus, I feel as though I am adequately prepared to use the measures. However, the focus of this research project represents a slightly new direction and will require me to conduct a literature review on personal beliefs (focusing on epistemological and self-regulated learning beliefs). I plan to engage in this literature search and review during the Fall of 2013. I have published several literature reviews in internationally peer-reviewed journals and am confident that these prior experiences have adequately prepared me for engaging in a meaningful literature review.

This preparation will also enhance my teaching. In my experiences, students' prior knowledge and belief systems act as a "filter" during learning. Thus, it is important to explicitly account for these belief systems in order to create an environment that maximizes learning. Money from this RSC would allow me to pursue this relatively new line of research examining the relationship between personal beliefs and SRL and thus enable me to further explore literature on epistemology and the role of these beliefs in learning. My teaching would most certainly benefit from increased engagement with this line of research. I envision the following timeline for this research project:

Time Period
September – October 2013 (I will be on sabbatical through January 2014): Conduct relevant literature reviews on personal epistemology and self-regulated learning. I plan to submit this literature review to an internationally peer-reviewed journal.
October 2013: Finalize methodology and procedure for study (please see below for details)
February – March 2014: Run participants
April 2014: Analyze data
May 2014: Submit findings to an international conference, possibly *American Educational Research Association* or *European Association for Learning and Instruction*

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

The relevant 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 will include a self-report questionnaire consisting of two sections, with the first one measuring SRL. This section included the 10 items from the Self-Regulated Learning Teacher Beliefs Scale (SRLTB; Lombaerts et al., 2009). The second section includes 32 questions from the Epistemic Belief Inventory (EBI; Shraw, Bendixen, & Dunkle, 2002), which measures 5 dimensions of personal epistemology modeled after Schommer's

(1990) inventory: *Omniscient authority, Certain knowledge, Quick learning, Simple knowledge,* and *Innate ability.* Participants respond to both sections with a 5-point Likert scale ranging from strongly disagree to strongly agree. Cronbach's alpha for the items have been shown to range between $\alpha = .60$ to $\alpha = .87$, and adequate validity has also been demonstrated (Schraw, Dunkle, & Bendixen, 1985).

A concurrent think-aloud protocol (Ericsson, 2006; Ericsson & Simon, 1994) will be used to measure the participants' use of various SRL processes *during* learning. In order to code participants' use of SRL processes, as gathered by the concurrent think-aloud protocol, modified codes developed by Azevedo and Cromley (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).

Procedure. Each participant was individually run. Following the completion of the consent form and questionnaire (measuring demographic information), participants will be given the following instructions for the learning task:

> *You are being presented with an electronic encyclopedia, which contains textual information, static diagrams, and a digitized video clips. I am trying to learn more about how students learn from technology environments. Your task is to learn all you can about the circulatory system in 30 minutes. Make sure you learn about the different parts and their purpose, how they work both individually and together, and how they support the human body. In order for me to understand how you learn about the circulatory system, I ask that you "think aloud" continuously while you read and search on the computer. Say everything you are thinking and doing. I'll be here in case anything goes wrong with the computer and the equipment. Please remember that it is very important to say everything that you are thinking and doing while you are working on this task.*

Next, participants will be given an overview of the hypermedia environment, during which they will be shown how to use the search functions and other navigation tools in the hypermedia environment. Then, participants will complete the self-report questionnaire measuring their epistemological and self-regulated learning beliefs. After completing this questionnaire, participants will be given 30 minutes to learn about the circulatory system. I will remain nearby during the learning task to remind participants to keep verbalizing if they are silent for more then three seconds (e.g., *"Say what you are thinking"*). The participants' verbalizations during the 30-minute learning task will be recorded and later used to analyze how they self-regulate their learning. Their personal beliefs (as measured in the self-report questionnaire) will be used as independent variables to predict specific self-regulated learning process (i.e. their planning, monitoring, and strategy use; see next page for complete SRL coding scheme).

Appendix A. *Classes, Descriptions and Examples of the Variables Used to Code Students' Self-Regulated Learning*

Variable	Description[1]	Student Example
Planning		
Planning	Stating two or more learning goals	"First, I'll look around to see the structure of environment and then I'll go to specific sections of the circulatory system."
Prior Knowledge Activation	Searching memory for relevant prior knowledge either before beginning performance of a task or during task performance	"*Their primary function is to carry oxygen from the lungs to every cell in the body*. Umm, red blood cells are red because the oxygen reacts with iron in the blood and um, which makes it rust, turn red."
Recycle Goal in Working Memory	Restating the goal (e.g., question or parts of a question) in working memory	"…what does blood do when it leaves the right side of the heart?"
Sub-Goal	Articulating a specific sub-goal that is relevant to the experiment-provided overall goal	"I want to learn more about plasma. I'm going to click on that."
Monitoring		
Content Evaluation (Plus)	Stating that just-seen text, diagram, or video is relevant	[Learner reads about red blood cells] "This is just was I was looking for."
Content Evaluation (Minus)	Stating that just-seen text, diagram, or video is irrelevant	"I'm reading through the info but it's not specific enough for what I'm looking for."
Expectation of Adequacy of Content (Plus)	Expecting that a certain content (e.g., section of text, diagram, video) will be adequate given the current goal	"…the video will probably give me the info I need to answer this question."
Expectation of Adequacy of Content (Minus)	Expecting that a certain content (e.g., section of text, diagram, video) will not be adequate given the current goal	"Mmm, circulatory system disorders..I don't think that will answer my question."
Feeling of Knowing (Plus)	Stating that there is an awareness of having read or learned something in the past and having some understanding of it	"Oh, I already read that."

[1] All codes refer to what was recorded with the think-aloud protocol

Feeling of Knowing (Minus)	Stating that there is an awareness of not having read or learned something in the past	"I didn't know that."
Judgment of Learning (Plus)	Indicating that there is an understanding of what was just read/seen	"Okay, this makes sense."
Judgment of Learning (Minus)	Indicating that there is not an understanding of what was just read/seen	"Wait, this isn't making any sense."
Monitor Progress Toward Goals	Assessing whether previously-set goal has been met	"Those were our goals, we accomplished them."
Monitor Use of Strategies	Commenting on usefulness of strategy	"Yeah, drawing it really helped me understand how blood flow throughout the heart."
Time Monitoring	Referring to the number of minutes remaining	"I'm skipping over that section since 40 minutes is too short to get into all the details."

Strategy Use

Control Video	Using pause, start, rewind, or other controls in the digital animation	*Then the heart relaxes, the aortic and pulmonary valves close, and diastole starts again*…….[Learner pauses video]
Coordinating Informational Sources	Coordinating multiple representations (e.g., drawing and notes)	"I'm going to put that [text] with the diagram."
Draw	Making a drawing or diagram to assist in learning	"…I'm trying to imitate the diagram as best as possible."
Evaluate Content as Answer to Question	Stating what was just read and/or seen meets an experimenter posed question	[Learner reads text]…" So, I think that's the answer to this question."
Inferences	Drawing a conclusion based on two or more pieces of information that were read within the same paragraph in the hypermedia environment.	"*Hypertension is elevated blood pressure, develops when the* blood- *body's blood vessels narrow, causing the heart to pump harder* Which I'm guessing could cause a heart attack."
Knowledge Elaboration	Elaborating on what was just read, seen, or heard with prior knowledge	"*Heat dissipates through the skin, effectively lowering the temperature.* Like a car radiator."
Memorization	Memorizing text, diagram, etc.	"I'm going to try to memorize this picture."
Re-reading	Re-reading or revisiting a section of the hypermedia environment	"I'm reading this again."
Review Notes	Reviewing notes	"Let me read over these notes now"
Summarization	Verbally restating what was just read, inspected, or heard in the hypermedia environment	"This says that white blood cells are involved in destroying foreign bodies."

Search	Searching the hypermedia environment	[Learner types in blood circulation in the search feature]
Taking Notes	Writing down information	"I'm going to write that under heart."