WGLN II 2006 RFP: Proposal Cover Sheet

PROJECT SHORT TITLE:	SiMErgency II:
Total Amount Requested	$295,939
Participating Institutions	Karolinska Institutet (Huddinge Hospital), Umeå University, and Stanford University
Amount Requested Per Institution	Karolinska–$86,140 Umeå–$50,000; Stanford (includes.Forterra sub-contract,$50K)–$159,799

INSTITUTION	Karolinska Institutet (Huddinge Hospital)
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INSTITUTION	Umeå University
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INSTITUTION	Stanford University
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Abstract *(maximum 200 words)*

SiMErgency II is about validation of a new method of training CPR into HS curricula, incorporating the December 2005 recommendations of the International Liaison Committee on Resuscitation (ILCOR) for CPR training. Validation studies with high school students taught the lay public level of CPR skills using scenarios in Virtual Worlds (May2006, SiMErgency I) will focus on knowledge recall, improved individual and team performance, confidence/self-efficacy, and motivation/'flow'. These recall, performance, and process assessments particularly important to simulation studies, will be related to gender and are evaluated as the unique assessment features of the SiMErgency II validation project. To satisfy IRB requirements in Sweden, studies will be extended beyond high school students to the healthcare provider level of CPR training for pre-clinical medical students; this requirement will be adopted in both countries. Modest development of two additional virtual worlds with avatars of both genders, different ethnic groups, and new animations (eg., avatar functions on a bedded 'victim', not only on the floor/ground) will provide adequate variations in the tool-kit, for more training scenarios. These include cross-cultural environments, and with multiple levels of professional training. SiMErgency II enables the beginning integration of virtual CPR into the curricula of four participating educational institutions.

Full Title: SiMErgency II: Validation of Virtual Worlds for Teaching the New CPR

• **Project Rationale – 1.1 Educational Problem: "**Ischemic heart disease is the leading cause of death in the world. Sudden cardiac arrest is responsible for >60% of the estimated 340 000 annual deaths from coronary heart disease in emergency departments or out-of-hospital in the United States. . . . The actions linking the victim of sudden cardiac arrest with survival. . . begin with early recognition of the emergency and activation of the emergency medical services (EMS) system, and early CPR. . . The most important determinant of survival from sudden cardiac arrest is the presence of a trained rescuer who is ready, willing, able, and equipped to act . . . Thus, the greatest challenge remains educating lay rescuers. Responding to this challenge requires increasing the effectiveness and efficiency of instruction, improving skills retention, and reducing barriers to action . . ." (Quote: December 2005 ILCOR report; Zaritsky, et al. 2005)

In January 2005, before SiMErgency I,(SiME I), two major studies demonstrated the ineffectiveness of standard CPR training of healthcare professionals. Despite the prevailing belief that using resuscitation manikins along with didactic instruction was an effective training methodology, about 25% of those trained shortly before testing on manikins failed correct performance; SiME I was conceived as a possible timely solution. Another result of the training dilemma was that medical specialists guiding the worldwide practice of CPR training (ILCOR– International Liaison Committee on Resuscitation) simplified the method, announcing it in December 2005, during the project period of SiME I. The consensus recommendation was reducing the breathing effort of rescuers, and focusing attention and effort onto sustaining circulation by repetitive, rapid chest compressions. The rationale is that compressions essential for sustaining the circulation concurrently produce adequate air-exchange, so that rescue breathing need be done less frequently. These procedural changes have been adopted in SiME I planning and current implementation with the CPR scenarios developed jointly with the Massively, Multi-player, Online Simulation (MMOS) training system of Forterra Systems, Inc., based on its' OLIVE (On-Line, Interactive, Virtual Environment) game platform.

In this simulation-based training system (also called "Virtual Worlds") students/trainees play the role of a character ("avatar") in a scenario. Students interact with other characters ("avatars") in the Virtual World, using the keyboard and mouse to control their avatar's actions/movements, using headsets connected to their computer to talk in real time with all other players in the world.

1.2 Proposed Solution(s): The key elements of SiME II are:

– adequate number of test subjects for statistical power; 12-15 subjects/group

– repeat testing after a lapse of six months, to evaluate retention of knowledge; appropriate actions in the correct sequence, conducted in a timely manner

– testing with strategies that elucidate psychological issues of process and competency

We hypothesize and will rigorously evaluate whether situated learning of CPR in virtual world scenarios solidifies retention of knowledge. With training and testing scenarios afforded by virtual worlds, we will validate the retention of prior learning of what to do, how to do it, and demonstrating the capability of actual performance. (The schedule of the WGLN II project dates serves well our study of the retention of knowledge of CPR, since the 24 students trained in May 2006 SiME I, can be re-studied in SiME II studies in October 2006). Because of our prior timely formative research, we've incorporated the December 2005 training recommendations of the ILCOR into our SiME II study scenarios. The combined studies of SiME I & II will enable an early and definitive assessment and report of the effectiveness of virtual environment scenarios on retention of learning in High Schooler's (HS) and in Pre-clinical med students (MS), two important study populations.

1.3 Research Questions: In SiME II Project, we address the following questions:

1) Does the individual HS and MS student's ability to respond quickly and appropriately to the first signs of an in-school emergency (i.e., performing basic first aid, including CPR) improve after deliberate practice with feedback in "Virtual World" simulated, in-school medical emergencies? (Learning outcome – individual performance, as a member of a team)

2) Does the 2-3 person HS and MS student's team ability to respond quickly and appropriately to the first signs of an in-school/hospital emergency (i.e., performing basic first aid, including CPR) improve after deliberate practice with feedback in "Virtual World" simulated, in-school/hospital medical emergencies? (Learning outcome – team performance)

3) Does confidence/self-efficacy improve with deliberate practice? (Process variables)

4) To what extent are subjects motivated during practice? (Process variables)

5) Do students who have had practice in "Virtual World" simulated medical medical emergency exercises retain their basic first aid knowledge and skills after 4-6 months, better than students who did not receive initial practice with feedback in "Virtual World" scenarios?

1.4 Summary of Previous Work Relating to this Proposal:

1.4.1 Psychological Tests: In a recent case study at Karolinska, affective learning outcomes were examined when 15 medical students (MS) practiced basic teamwork in emergency medicine on a Human Patient Simulator [HPS (Hedman et al., 2006)]. Students participated in a team-coordination course using five full-scale patient scenarios as the main instructional method. Data for students´ *engagement modes, self-efficacy, mental strain and flow experience* were collected before, during and after practice. Trainees experienced a high Flow during the scenarios although the mental strain was low. Simulator practice resulted in increased positive engagement modes - *efficiency/productivity, enjoying/acceptance, ambition/curiosity.* In particular, females´ Self-efficacy increased in response to training ($p \leq 0.050$) in parallel to a reduction in Frustration/anxiety ($p \leq 0.026$). This result were confirmed in exit questionnaires: students reported a highly overall positive experience to practice. Hence, basic teamwork training in emergency medicine using the HPS resulted in several positive affective outcomes. This formative research of user responses to simulation informs our current proposal.

1.4.2 In California: Project Activities and Outcomes

Project Inputs	Project Activities	Outputs/Products	Project Outcomes

Graphic settings, "assets" and scripts from previous SUMMIT "SimTech" Project—the Virtual ED (a clinical learning environment)	Further develop the clinical learning environment to include the High School classroom, hallways, and parking lot settings and youthful characters/patients for 5 scenarios	Fully developed virtual learning environment, including 3 clinical settings and characters/patients for 5 scenarios; 5 additional scenarios drafted; total of 10 scenarios	Trained instructor in a California High School, and trained physician and high school instructors in Sweden, prepared to conduct training in Virtual World scenarios. A California physician has been recruited to train medical students at Stanford in CPR, but has not been trained for late May instruction/testing The training / testing in the Redwood HS is scheduled for May 8-9, 2006; instruction in using the software is scheduled for May 8th, and training and testing on May. 9th, 2006. Students in the cross-cultural medicine class (May 19, 2006) for the MS group.
Printed recommendations from ILCOR on new CPR methods	Adapt the existing American Heart Association methods used in the clinical learning environments, to include new procedures in new scenarios	Fully developed team training curriculum, including assessment instruments - (observation with rating scale) and rating guidelines for assessors	
Selected American Heart Association certified CPR teacher	SUMMIT team underwent training on how to conduct CPR as individuals and as teams in preparation for online virtual worlds, including how to debrief the online role-playing learning experience. Visits to Forterra, and regular participation in planning meetings.	Training protocol and instructional materials, including project website, learning goals & objectives, clinical learning environment(s), 5 completed scenarios, and 5 drafted scenarios, awaiting development of settings and assets.	
Visit of Dr, Creutzfeld and Karl Stengard from Karolinska and Huddinge HS	Discussing the training and testing in respective countries. Visit to Forterra to see the settings and assets in development.	Fully prepared application of training CPR in Huddinge HS and Redwood HS, and Stanford School of Medicine.	

1.4.3 In Sweden: Project Activities and Outcomes

Project Inputs	**Project Activities**	**Outputs/Products**	**Project Outcomes**

Printed recommendations from ILCOR on new CPR methods	Adapt the existing Roda Korset Association methods used in the clinical learning environments, to include new procedures in new scenarios	Fully developed team training curriculum, including assessment instruments - (observation with rating scale) and rating guidelines for assessors	Trained instructor in California HS met with trained physician and HS instructor from Sweden, preparing to conduct training in Virtual World scenarios. The training / testing in the Huddinge HS is scheduled for May 16-18, 2006; In the Medical School, the dates are May 21-24, 2006.
Selected Roda Korset certified CPR teacher	Karolinska team underwent training on how to conduct CPR as individuals and as teams in preparation for online virtual worlds, including how to debrief the online role playing learning experience	Training protocol and instructional materials, including project website, learning goals & objectives, clinical learning environment(s), 5 completed scenarios	
Visit of Dr, Creutzfeld and Karl Stengard of KI and Huddinge HS to Redwood HS, SUMMIT, and Forterra	Discussions for coordinating the training and testing in respective countries	Fully prepared application of training CPR in Huddinge HS and University Hospital	

See screen-shots of the HS settings, reports, etc at http://summit.stanford.edu/wgln/simergency/

1.5 Scenario Development: Five of ten scenarios developed utilizing two high school settings have been implemented including: 1) female teacher collapses in classroom, 2) male teacher collapses in classroom, 3) female student collapses in school hallway, 4) adult male collapses in parking lot, 5) male student collapses in parking lot. Collapsing is enacted by a victim (a teacher, student, or researcher), and learners enact selected roles implementing their knowledge of Basic Medical Emergency management, emphasizing CPR, when appropriate (four of five scenarios). When testing with these scenarios, pre-assignments are NOT made so that valid testing of knowledge and teamwork is allowed to 'happen', and results are thus evaluable. Future work will enable social issues relating to culture and ethnic-origin, and other learning objectives to be addressed in relation to emergency medical responses.

1.6 Virtual settings and other 'assets' development: Some settings and 'assets' in the Forterra Library, including avatars depicting different gender and ages can be re-purposed, much like real stage settings and 'props' in theaters. In the development phase of SiME I, Forterra's artists and engineers designed and developed three virtual high school settings: 1) a classroom with tables and chairs, etc., 2) a hallway with doors leading into the Principal's Office, a trophy case, etc., and 3) a parking lot with vehicles. Photographs of Huddinge HS and Redwood HS guided Forterra's artists' development. A relevant inventory of settings and assets follows:

Forterra Library	SiMErgency I Library	SiMErgency II Library (proposed)
Settings: urban city setting, streets, buildings, etc.; hospital entrance setting with waiting room and hallway; *Character Assets:* dozens of m/f adults of different ethnicities (anglo, african, mid-eastern, hispanic), various professional and casual dress; vehicles, gurneys, etc. *Animation Assets:* Walking, kneeling, running, numerous hand gestures and body gestures	*Settings:* High School building, parking lot, interior hallway, classroom *Character Assets:* 2 anglo & 3 hispanic male students, 3 anglo & 3 hispanic female students, casual (student-style) outfits. *Animation Assets:* CPR victim animations (three types), CPR rescuer animations (six types), in an emergency situation	*Settings:* High School outdoor track, cafeteria, Emergency room with multiple stations *Character Assets:*m/f students in sport clothes, medical staff dress; special dress for jewish men and islamic women. *Animation Assets:* CPR animations in hospital setting

1.7 Preparation of HS and Medical School training/test sites.

1.7.1 Huddinge HS: Karl Stengård (PhD), teacher in natural sciences at Huddinge HS, has prepared the students who will be given opportunity to participate in SiME I with the new CPR training curriculum. Computer facilities at Huddinge HS have been secured and an updated software version from Forterra with new settings and assets was installed and tested on March 17th, preparing for the May instruction/testing. Test subjects will communicate verbally in Swedish but will use an US keyboard for electronic communication.

1.7.2 Karolinska University Hospital Huddinge): Christopher Medin, MSc in engineering and Johan Creutzfeld, MD, consultant in anesthesiology and intensive care at KI, have upgraded computer facilities at the Center for Advanced Medical Simulation for simultaneous SiMErgency I & II trials of medical and nursing students at KI. During a visit to Forterra, they learned Olive's functionality and installation requirements. Dr. Creutzfeld also discussed coordination of the

Swedish CPR curriculum with American standards. The 30:2 chest compression:insufflation ratio used in US CPR training, will replace the Swedish ratio of 15:2. Consequently in SiME I & II, for coordinated training, both HS and medical(MS) and nursing students (NS), will train with the new ILCOR guidelines. This change in training has been negotiated and approved for this study of the Swedish CPR curriculum. The debriefing will be conducted by Mr Stengaard and Dr. Creutzfeld at Huddinge HS, and by Dr. Creutzfeld at KI.

1.7.3 Redwood HS and Forterra: Kim Hansen, Biology teacher at Redwood HS has prepared scenarios by spending eight weeks at SUMMIT at the beginning of the project, and attending regular, joint work-meetings of SUMMIT and Forterra staffs. Both organizations have allocated computers to be equipped with the March 2006 version of Olive software; five systems will be available at the High School for the May 9th testing. The room has been scheduled, the students recruited, a substitute teacher hired for Ms. Hansen. The debriefing will be conducted by Ms. Hansen and Dr. Heinrichs.

1.7.4 Stanford School of Medicine, Dr. Ron Garcia, Ass't Dean of Minority Studies will recruit 12 medical students in his class, Cross-cultural Medicine, allowing the research team to conduct the study during May 2006 and beyond, in SiME II. This previously unplanned component of SiME I that surfaced with the Swedish IRB application process, will also be conducted at SUMMIT with the debriefing conducted there by Dr. Garcia and Dr. Heinrichs.

- **2.0 Work Plan** The activities and timeline for the proposed work appear in Table 1 (next page)

2.1 Technical development: Of the ten scenarios developed, five have been implemented in the test phase of SiME I, and these settings, avatars, and other virtual assets will continue serving during SiME II. In addition, design and development of two additional settings (a running track and a cafeteria), and 'assets' of avatars (supporting ethnicity, and sports and religious garments, e.g, avatars reflecting Asian, African-American, and Latino ethnic groups, young Jewish men in

Table 1: Timeline for proposed work

Timing / Activities	2006 M1	M2	M3	M4	2007 M5	M6	M7	M8	M9	M10	M11	M12
KI, SU teams: Design 5 new scenarios; Make adjustments for Med student population												
Forterra: Author scenarios, assets & avatar actions												
Assess returning students for retention of CPR knowledge												
Train and assess new students—High School and Medical School												
Train Teachers, Med School Faculty & Technical Support												
Implement												
KI Team (SE)												
Stanford Team (CA)												
Analyze Evaluation Data & Write Report												

yarmulke's and Islamic women dressed in appropriate garments, will afford addressing cultural/ religious issues related to medical emergencies, and offer non-repetitive experiences in the remaining five scenarios. For MS, avatars with shirts and ties, blouses and slacks, & white coats are used. Two emergency settings (ER exam and ICU-stations) will support the clinical focus.

• **3.0 Project Evaluation**. The research questions proposed in section **1.3** will be addressed as follows: Questions 1 and 2 will be addressed by 1) assessing the performance of the individual students, as members of an ad hoc rescue team, and 2) assessing team performance—the correctness and speed with which the 3-4 person team responds to the medical emergency. Questions 3, 4 will be addressed by assessing process variables of motivation, flow and self-efficacy, using survey questionnaires, at regular intervals before, during, and after the simulation exercises. Question 5, assessing gender differences in approach to the task and in performance, will be addressed in the analysis of the questionnaire responses and learning outcome data.

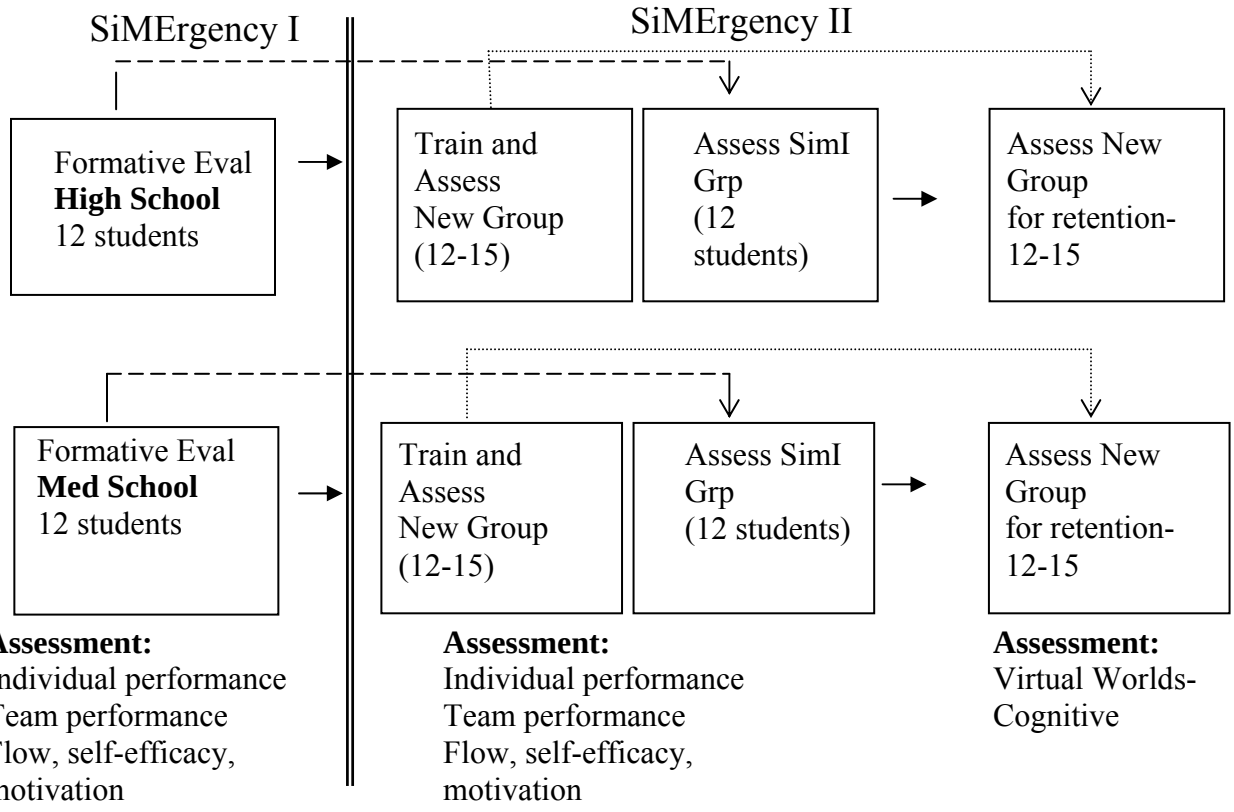
3.1 Target Population We will train and assess two target groups of learners—HS and MS/NS

– who have completed basic instruction in CPR with lectures, videotapes and manikin practice. The study will be implemented following the same research protocol in both Sweden and the US.

3.2 Learning Goals and Assessment Criteria Our hypothesis is that practice with feedback in the virtual worlds will improve learning and retention of cognitive and team skills among both HS students and MS/NS. The specific learning objectives in SiME II include:

1) Describe the correct procedures for administering basic first aid in a given medical emergency (including CPR, Heimlich maneuver, stroke, etc.)--Cognitive
2) Choose to respond quickly and appropriately to resuscitate the victim in a medical emergency--Affective
3) Coordinate one's rescue efforts with others at the scene in a prompt, efficient manner--Team performance

3.3 Training and Assessment Plan (Research design)



Both the individual student and the student team's performance of the basic first aid skills will be

observed and assessed by two trained raters (HS teachers and MS faculty) using a Likert type rating scale to identify low, average, and high performance of the following target behaviors: 1) taking a leadership role in a timely manner, 2) establishing a safe environment, 3) asking for assistance of other bystanders (e.g. phoning for help, providing relief in conducting CPR, 4) communicating with team members and victim appropriately, and 5) changing roles – "hand-off" to professional help when it arrives, 6) maintaining stability until professional help arrives.

3.4 Affective Component of Learning: Motivation/Curiosity, Flow and Self-Efficacy:

Background: Previous studies on the effectiveness of using simulations as tools in a training curriculum have focused inadequately on the emotional content of learning experiences. One reason is that most theories of skills acquisition are dominated by psychomotor skills and cognitive development. The strong affective component to learning (Ferro, 1993), and positive or negative learning experiences exert a powerful influence over the acquisition of medical skills Moreover, motivation is a key issue whose effect upon training is often neglected (Kneebone, 2005). In particular, training must be based on a determination to improve, and self-efficacy is crucial to effective development of competence (Guest, et al. 2001). Kraiger and collaborators emphasized that evaluations of various levels of achievement as well as criteria in formative evaluations of learning outcomes, should be model-based (Kraiger, et al, 1993). In this study we propose to assess the specific process variables of motivation (curiosity/exploration), flow and self-efficacy, in addition to assessing the performance outcomes. We will base our work in this study on specific models of behavior within social cognition and human factors.

3.4.1 Curiosity/Exploration: Cashdan and collaborators have recently conceptualized curiosity as a positive emotional-motivational system associated with the recognition, pursuit, and self-

regulation of novelty and challenge (Cashdan et al., 2004). Using five independent samples, they developed the Curiosity and Exploration Inventory (CEI) comprising two dimensions: exploration (strivings for novelty and challenge) and absorption (full engagement in specific activities). The first factor refers to strivings for novel and challenging information and experiences. The second factor refers to the propensity to be deeply engaged in activities. The CEI-trait is a self-report instrument with seven items on a 7-point Likert-type scale. The CEI has good internal reliability, and shows moderately large positive relationships with intrinsic motivation. Moreover, the CEI is relatively unaffected by socially desirable responding. The CEI takes two minutes to complete; but has no time limit. A state version of the CEI (CEI-state) has also been validated, demonstrating sensitivity to change.

3.4.2 Flow experience: An additional model of Flow experience (Csikszentmihalyi, 1997) has been used for assessment of learning outcome criteria in content evaluations (Hedman and Sharafi, op.cit.). In the present study we will use this model for evaluations of process criteria of learning outcomes, since it has been suggested that flow is a useful construct in describing a positive human computer interaction (Ghani and Deshpande,1994; Finneran and Zhang, 2005). A flow experience during an activity seems to facilitate learning, encourage one to carry out difficult tasks, promote the pace of productivity, increase the joy and satisfaction, and also creates meaning for involvement in a different course of action (Csikszentmihalyi, 1990). According to this simple model, to experience flow while engaged in any activity, individuals must perceive a balance between their skills and the challenges of the interaction. Ghani and Deshpande (op.cit.) have proposed five fundamental components of flow as related to the specific use of computers: Pleasure, Concentration, Control, Exploration, and Challenge, and developed a psychometric scale for measuring these components. For assessing flow we will use the Karolinska flow-scale, which partly is based on Ghani and Desphande´s scale.

3.4.3 Self-efficacy: Another individual variable and a powerful predictor of performance outcome is Self-efficacy, the belief that one can perform specific tasks and behaviors (Bandura, 1997), a fact demonstrated repeatedly in training research (Cole and Latham, 1997). Self-efficacy beliefs determine how people feel, think, motivate themselves and behave. Such beliefs produce these diverse effects through four major processes. They include cognitive, motivational, affective and selection processes. People with high assurance in their capabilities approach difficult tasks as challenges to be mastered rather than as threats to be avoided. Such an efficacious outlook has been shown to foster intrinsic interest and deep engrossment in activities (Bandura, op.cit.). Self-efficacy holds greater explanatory and predictive power for academic outcomes than many other determinants, and interventions demonstrating success in raising academic self-efficacy include various forms of modeling (Pajares, 1996; 1997). Herein, we will use the subscale (of five items) constructed to assess students` perception of self-efficacy and which show promising predictive validity.

3.4.4 Retention of Learning: The criteria of retention include 1) assumption of leadership in a timely manner, 2) establishing a safe environment, 3) working well with others, 4) asking for assistance of other bystanders for attending to the need for calling for help, 5) asking for relief because of fatigue, 6) closing communication 'loops', and 7) changing roles – "hand-off" to other capable bystanders, 8) maintaining stability until professional help arrives.

• **4.0 Collaboration and Integration:** Strong collaboration between the teams at KI, Umea, and Stanford was established in 2003 as we began development and evaluation work in the area of simulation–based learning for healthcare teams. Together we created the Virtual ED and conducted randomized controlled trials in Sweden & the US, comparing its usefulness for learning

with the current gold standard for team training in Crisis Resource Management-- the Human Patient Simulator (Srivastava, 2005). In SiME I we continued our collaboration by expanding our focus to provide high school students a new way of learning the communication, decision-making and other team skills necessary for rapid response to a medical emergency, including CPR, in the high school setting. We collaborated with a commercial gaming company (Forterra Systems, Inc.) to create an improved Virtual Worlds platform and new scenarios for situated learning.

Our first collaborative project, SimTech, we developed 'in-house' the 3D Virtual Worlds technology for multi-player role-playing scenarios. Once developed, we were able to conduct randomized controlled trials comparing the new training approach with the Human Patient Simulator. (Srivastava, 2005) In SiME I, we out-sourced the technical development to experienced software development professionals, permitting the new KI, Umea and SU research teams, including the teachers at Huddinge and Redwood HS's, to focus on their strengths. This expanded team has been creating educationally valid learning scenarios and becoming familiar with the new teaching methodology of multi-player role-playing games. It has also followed the leadership of Leif Hedman, planning and implementing evaluation studies that are unique for this technology. In SiME II, new collaborators will help us extend the project to include implementation of randomized controlled trials in both the HS and MS settings, in both countries. Karl Stengård (PhD), from Huddinge HS has visited Kim Hansen in Redwood City and Forterra, Christopher Medin and Johan Creutzfeld, MD, from KI have also visited SUMMIT and Forterra. Ron Garcia, MD, Ass't Dean of Minority Affairs, is also scheduled to visit SUMMIT for a demo.

• **5.0 Sustainability:** Implementing SiME II will provide a rich set of findings with which we can define what type of training system delivers what level of training/learning result, and what levels of knowledge retention prevails after six months. These promising outcomes will be essential before telling educators or training organizations about the virtual worlds system(s) for training

CPR. We had shown our initial virtual world for training EM students (SimTech project) for the local chapter of the American Red Cross (ARC), a major CPR training organization; we discovered great interest, but we had neither a CPR training method nor data about its impact on either learning or retention. After SiME II is completed, we will be well positioned to propose doing pilot studies with ARC trainers, as well as with the American Heart, the Red Crescent, and the Svenska Roda Korset organizations, to evaluate virtual worlds training themselves.

Also, Kim Hansen, biology teacher in the Sequoia Union District, was honored at Stanford for her work in designing SiME I scenarios; Denise Plante, Principal of her school, and Patrick Gemme, PhD, Superintendent of the District attended. Recognition by her school system leadership encourages seeking and finding opportunities of introducing the methodology into more schools – a second one is promised. Ms. Hansen also presented the work-in-progress at the California Association of Bilingual Educators meeting, and received excellent encouragement from her peers. At Stanford, a teacher in Hawaii has asked during one of SUMMIT's workshops, for the opportunity of introducing this learning technology in her school system. We will follow-up with Hawaii when SiMErgency II is complete. In Sweden, the school district leadership is also watching closely the result of this experiment, considering further use. In an Invited Lecture/Demonstration at the Oklahoma University School of Medicine, Dr. Heinrichs' alma mater, the first external viewing of the SiMErgerncy I virtual worlds, is scheduled for April 21, 2006. The OU-Tulsa Campus will be 'online' with OU physicians being trained in the new CPR. This is an example of the dissemination methods useful to us. In addition, SUMMIT annually hosts dozens of visitors from around the World, who come to see and hear about our projects. We will also actively seek recognition of our work by other presentations at scientific meetings and in direct contacts with professional organizations. Finally, because SiME II uses guidelines of the 2005 International Consensus on Science with Treatment Recommendations (CoSTR) and (ILCOR), these groups will be approached for wide evaluation and adoption.

Appendix: List of references/publications: one-page

• ILCOR 2005 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. Circulation. 2005; 112:III-1-125
• Zaritsky A, Morley P. The evidence evaluation process for the 2005 international consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations.Circ.2005;112:III-128-130
• Bandura A. (1997). Self-Efficacy: The Exercise of Control. New York: Freeman.
• Cole ND, and Latham GP. (1997). Effects of training in procedural justice on perceptions of disciplinary fairness by unionized employees and disciplinary subject matter experts. *Journal of Applied Psychology, 82,* pp. 699–705.
• Csikszentmihalyi M (1997*). Finding Flow: The Psychology of Engagement With Everyday Life*, Basic Books.
• Csikszentmihalyi M.(1990). *Flow: The psychology of optimal experience*. New York: HarperCollins.
• Ferro TR. (1993). The influence of affective processing in education and training. In: *Flannery DD (Ed). Applying Cognitive Learning Theory to Adult Learning*. San Francisco: Jossey-Bass; p. 25–33.
• Finneran CM, and Zhang P. (2005). Flow in computer-mediated environments: promises and challenges. *Communications of AIS, 15*, pp. 82-101.
• Ghani JA, and Despande PD. (1994). The characteristics and the experience of optimal flow in human-computer-interaction. *Journal of Psychology, 128*, pp. 381 – 391.
• Guest CB, Regehr G, Tiberius RG. (2001). The life long challenge of expertise. *Med Education,35*, pp. 78–81.
• Hedman L, Meurling L, Wallin C-J, & Felländer-Tsai L. (2006). Goal-oriented team training using a Human Patient Simulator: Gender-specific engagement modes, self-efficacy and flow experiences. Manuscript for *MedEduc*.
• Kneebone RL. (2005). Evaluating Clinical Simulations for Learning Procedural Skills: A Theory-Based Approach. *Association of American Medical Colleges 80*,6, pp, 549-553.
• Kashdan, T.B., Rose, P., & Fincham, F.D. (2004). Curiosity and Exploration: Facilitating positive subjective experiences and personal growth opportunities. *Journal of Personality Assessment, 82*(3), 291–305
.• Srivastava S Harter P, Youngblood P , Dev P , Wallen C-J; Fellander-Tsai L, Heinrichs W L, A web-based virtual 3D world for team training in trauma management. Presentation at MMVR2004, Los Angeles, CA Jan. 2004

Publications:

[a] Hansen K, Huang C. How to Use and Design Interactive Simulations and Educational Games to Complement Your Science Curriculum, Presented at the California Association of Bilingual Educators (CABE) 2006 meeting, San Jose, CA March 1-4, 2006

WGLN PROJECT BUDGET SUMMARY

Form No. 2

	FOR WGLN USE ONLY		
ORGANIZATION Umeå University	PROJECT NO.	DURATION (MONTHS) Proposed	 Granted
PROJECT LEADER Leif Hedman			

A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title.	Percent Effort (fraction of full time) and Months Percent	 Months	Funds Budgeted Planners	
1. Leif Hedman, PhD	33	10	$40.000	
2. I	5	10	4.000	
5.				
6. ( ) TOTAL OTHERS NOT LISTED HERE (LIST ON SEPARATE SHEET)				
TOTAL SENIOR PERSONNEL (1-6) ( )			40. 000	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)				
1. Ingrid Schele, PhD student in psychology	5	10	4.000	
TOTAL SALARIES AND WAGES (A + B)			44.000	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)			44.000	

D. EQUIPMENT (LIST ITEM AND **DOLLAR** AMOUNT FOR EACH ITEM EXCEEDING $5,000/11,000DM/55,000SEK) Supplies/replacements		
TOTAL EQUIPMENT	1.000	

E. TRAVEL 1. FOREIGN (Airfare Umeå-California, Stanford)	3.000	
2.		

F. PARTICIPANT SUPPORT (support given to subjects participating in the project such as students, etc) 1. STIPENDS $ 1500 2. TRAVEL 3. SUBSISTENCE 4. OTHER		
TOTAL PARTICIPANT COSTS		

G. OTHER DIRECT COSTS		
1. MATERIALS AND SUPPLIES		
2. PUBLICATION/DOCUMENTATION/DISSEMINATION		
3. CONSULTANT SERVICES (psychometric scaling and statistical analyses of psychometric data)		
4. COMPUTER SERVICES	2.000	
5. OTHER		
TOTAL OTHER DIRECT COSTS		

H. TOTAL DIRECT COSTS (A THROUGH G)	50.000	
I. AMOUNT OF THIS REQUEST (including 18% indirect costs at Karolinska Institutet	$50.000	

NAME OF PERSON PREPARING THIS FORM Leif Hedmani	**DATE** 2006 04 02	**FOR WGLN USE ONLY**		

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WGLN PROJECT BUDGET SUMMARY

Form No. 2

ORGANIZATION Karolinska Institutet	FOR WGLN USE ONLY PROJECT NO.	DURATION (MONTHS) Proposed	 Granted
PROJECT LEADER Li Felländer-Tsai			

A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title.	Percent Effort (fraction of full time) and Months Percent	 Months	Funds Budgeted Planners	
1. Li Felländer-Tsai, MD, PhD	12	10	$13.250	
2. Johan Creutzfeldt, MD	15	10	11.550	
3. Karl Stengard, PhD, High School teacher	15	7	7.200	
4. Carl-Johan Wallin, MD, PhD	5	8	3.560	
5.				
6. ( ) TOTAL OTHERS NOT LISTED HERE (LIST ON SEPARATE SHEET)				
TOTAL SENIOR PERSONNEL (1-6) ( )			35.560	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)				
1. Christopher Medin, MSc, engineer	15	10	8.150	
2. Kai Mäkinen, MSc, engineer	10	10	6.870	
3. Lisbeth Meurling, MD, PhD candidate	10	10	6.250	
4.				
5.				
6.				
TOTAL SALARIES AND WAGES (A + B)			56.830	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)			56.830	

D. EQUIPMENT (LIST ITEM AND **DOLLAR** AMOUNT FOR EACH ITEM EXCEEDING $5,000/11,000DM/55,000SEK) 5 portable computers including software and headsets (USD 6000)		
TOTAL EQUIPMENT	6.000	

E. TRAVEL 1. DOMESTIC (Airfare Umeå-Stockholm for meeting with Leif Hedman)	2.500	
2. FOREIGN (Airfare Stockholm-California, Stanford)	3.800	

F. PARTICIPANT SUPPORT (support given to subjects participating in the project such as students, etc)		
1. STIPENDS $ 1500		
2. TRAVEL		
3. SUBSISTENCE		
4. OTHER		
TOTAL PARTICIPANT COSTS	1.500	

G. OTHER DIRECT COSTS		
1. MATERIALS AND SUPPLIES	100	
2. PUBLICATION/DOCUMENTATION/DISSEMINATION	770	
3. CONSULTANT SERVICES		
4. COMPUTER SERVICES (support, webconfiguration, firewall issues within the Stockholm County and Huddinge County)	1.500	
5. OTHER		
TOTAL OTHER DIRECT COSTS	2.370	

H. TOTAL DIRECT COSTS (A THROUGH G)	73.000	
I. AMOUNT OF THIS REQUEST (including 18% indirect costs at Karolinska Institutet	$86.140	

NAME OF PERSON PREPARING THIS FORM	**DATE**	**FOR WGLN USE ONLY**

Li Felländer-Tsai	2006 03 31			

WGLN PROJECT BUDGET SUMMARY

Form No. 2

ORGANIZATION Stanford University – SUMMIT	FOR WGLN USE ONLY PROJECT NO.	DURATION (MONTHS) Proposed	 Granted
PROJECT LEADER Wm. LeRoy Heinrichs			

A. SENIOR PERSONNEL: PI/PD, Co-PIs, Faculty and Other Senior Associates List each separately with name and title.	Percent Effort (fraction of full time) and Months Percent	 Months	Funds Budgeted Planners	
1. Wm. LeRoy Heinrichs MD, PhD,	10	12	$18,551	
2. Patricia Youngblood, PhD, Evaluation	15	12	22,454	
3. Parvati Dev, PhD, Director, SUMMIT	15	12	7.169	
4. Ron Garcia, PhD, Ass't Dean, Minority Affairs			2,000	
5. Phillip Harter, Md, Emerg. Medicine			2,250	
6. ( ) TOTAL OTHERS NOT LISTED HERE (LIST ON SEPARATE SHEET)				
TOTAL SENIOR PERSONNEL (1-6) ( )			$52,424	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)				
1. Robert Cheng, MEng, engineer	10	12	6,963	
2. Kingsley Willis, BA, Digital Artist	10	12	4,400	
3. Kim Hansen-Guzman, HS teacher			7,000	
4.				
5.				
6.				
TOTAL SALARIES AND WAGES (A + B)			70,787	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)			20,642	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)			91,429	

D. EQUIPMENT (LIST ITEM AND **DOLLAR** AMOUNT FOR EACH ITEM EXCEEDING $5,000/11,000DM/55,000SEK) 5 portable computers including software and headsets (USD 7,500)		
TOTAL EQUIPMENT	7,500	

1. DOMESTIC: Long Beach, CA (MMVR), Orlando, FL (EVISTA)	2.500	
2. FOREIGN (to Stockholm from Stanford University) – two persons	4.000	

F. PARTICIPANT SUPPORT (support given to subjects participating in the project such as students, etc) 1. STIPENDS $ 3000 – HS & Med School	3,000	
	3,000	

G. OTHER DIRECT COSTS		
1. MATERIALS AND SUPPLIES	100	
2. PUBLICATION/DOCUMENTATION/DISSEMINATION	770	
3. CONSULTANT SERVICES;		
4. COMPUTER SERVICES (support, webconfiguration,)	500	
5. OTHER: Forterra Systems Sub-contract; Research Design, Development, Operation Support, ($19,000), Art assets, animations ($25,000), Engineering ($5,000), Audio ($1,000)	50,000	
2		

H. TOTAL DIRECT COSTS (A THROUGH G)	$159,799	
I. AMOUNT OF THIS REQUEST	$159,799	

NAME OF PERSON PREPARING THIS FORM Wm. LeRoy Heinrichs, MD, PhD	**DATE** 4-3-2006	**FOR WGLN USE ONLY**		

The Microsoft Word version of this document is an enabled form. Type your responses in the gray boxes, save the file and append to, or attach with, full proposal. The PDF version is not form enabled.

Budget Narratives:

- **UMEÅ UNIVERSITY**

Leif Hedman, PhD, Associate Professor. Research Director at Skill Acquisition Lab at Umeå Univeristy. He will manage the Umeå University aspect of the project, and work closely with teachers and researchers in the Karolinska Institutet Medical School, translate the psychometric language into the Swedish and English language. He will also design the studies. He will perform a tedious preparation of evaluation tools used in our study and analysis of all psychometric data acquired from these tools including adjustment of all psychometric instruments (e.g. all instructions must be redesigned to fit our groups of High School students in Huddinge and Stanford). Finally he will be partly responsible in writing reports, papers and articles as well as reporting findings to WGLNII. He will design instructions as requested by the Huddinge and SUMMIT teams in using the psychometrics instruments. 30% effort during 10 months.
Ingrid Schele, PhD student. She will assist in scoring of psychometric data at both sites. 5% effort during 10 months.
Finance administrator: (Umeå): Mona Wiklund-Hed, Department of Psychology, Umeå University, S-901 87 Umeå, Sweden. Telephone: +46 90 7866402, e-mail: mona.wiklund@psy.umu.se

• KAROLINSKA INSTITUTET (KI)
A. Senior Personnel:
Li Fellander Tsai, MD, PhD; Associate Professor, and Director of the Karolinska Simulation Center. She will manage the Huddinge – Karolinska aspect of the project, work closely with the Huddinge High School teachers and teachers in the Karolinska Institutet Medical School, develop scenarios jointly with the SUMMIT team, oversee translation of the medical language into the Swedish language. She will also design and conduct the studies at Karolinska Instititet. 12% effort. 10 months.
Johan Creutzfeldt, MD: He will assist Dr. Tsai in developing relevant scenarios, oversee the medical aspects and implement the scenarios in the Huddinge Senior High School and relevant courses at Karolinska Institutet Medical School. He will also assist with review of scenarios and apply best practices of rescue training for first responders into them. He will be present during the training with the CPR simulation game, and assist with the debriefing. He will be active in the evaluation and assist in writing reports. 15% effort, 10 months.
Karl Stengard, PhD: He will implement the studies at Huddinge Senior High School within the science curriculum and work closely with the High School students and other science teachers at Huddinge Senior High School. He will assist with the debriefing upon completion of a scenario. He will also be responsible for the firewall issues in Huddinge County. He will also assist in data analysis and assist in writing reports. 15% effort, 7 months.
Carl-Johan Wallin, MD, PhD:
He will assist in implementation the scenarios in relevant courses at Karolinska Institutet Medical School, he will also assist in writing reports and publications. 15% effort, 8months.

B. Other Personnel:
Christopher Medin, MSc, Biomedical engineer: He is a member of the Simulation Center team who is responsible for the hardware and software management and support and trouble shooting. He will be responsible for fire wall issues within the Stockholm County) He will also assist in managing the training stations at the Huddinge High School for the testing; 15% effort, 10 months.
Kai Mäkinen, BSc, Biomedical engineer: He is a member of the Simulation Center team and will assist in the hardware and software management. He will also assist in managing the training stations at the Huddinge High School for the testing; 10% effort, 10 months.
Lisbeth Meurling, MD: She will assist with review of scenarios and apply best practices of rescue training for first responders. She will also assist in the implementation of scenarios in Medical School. 10% effort, 10 months

C. Equipment:
Portable computers with 1 GB RAM will be acquired for USD 6000
D. Travel:
USD 2.500 will be allocated for domestic travel between Umeå and Stockholm and 3.800 will be allocated for travel to California (Stanford and MMVR meeting to present results)
E. Participant support/Stipends:

USD 1500 will be allocated for incentives for study participants.

F. Other Direct Costs:

USD 2.370 is allocated to materials, publications/dissemination and computer services including costs for fire wall modifications.

• STANFORD UNIVERSITY (SUMMIT) AND FORTERRA SYSTEMS, INC.

A. Senior Personnel:

Wm. LeRoy Heinrichs, MD,PhD; Professor (Emeritus, Active) and Past Chair, Dept. of Ob/Gyn,, and Associate Director, SUMMIT. He will oversee the entire project, engage in the negotiations with Forterra, and develop agendas, initiate and lead meetings of the research team, both with video conferencing and in virtual worlds. He will participate in the studies of HS and MS studies, acting as a debriefer, and making assessment of learning using the test instruments developed for the project. He will supervise development of reports, presentations, and interact with the financial officer of the project, and interactions with the WGLN Committee. 10% effort, 12 months

Patricia Youngblood, PhD; Senior Research Staff, SUMMIT, Director of Evaluation. She will design the studies being used in the entire project, in collaboration with Leif Hedman, PhD of Umea University. She will instruct HS and MS teachers and faculty at Stanford University in the use of the virtual worlds for the project, and schedule the testing with them. She will secure and assure the adherence to the IRB requirements, and securely maintain the records at SUMMIT. She will participate in development of reports, presentations, and other activities of the project team. 20% effort, 12 months

Parvati Dev, PhD, Director, SUMMIT. She will oversee the SUMMIT performance of the milestones of the project, and advise and facilitate the activities within the research group. She will assist with negotiations of IP and fiscal issues with Forterra Systems, Inc. 5% effort, 12 months

Kim Hansen, Biology teacher, Redwood HS; She will implement the studies at Redwood High School within the science curriculum and work closely with the High School students and other science teachers in the Sequoia Union High School District. She will teach other teachers in collaborating HS in the District in how to integrate virtual worlds as a training tool into their curricula. 100% effort, 2.5 months

Ron Garcia, PhD., Ass't Dean Minority Affairs, and Ass't Prof. in Community and Family Medicine. He will recruit medical student participants attending his class on Cross-cultural Medicine, and will assist with the debriefing upon completion of scenarios with issues of ethnicity. His role of consultant includes advising the content of scenarios reflecting his expertise in cross-cultural medicine. 2 days effort, $1,000/day

Phillip Harter, MD, Ass't Professor, Division of Emergency Medicine. He will advise about the application of CPR for healthcare personnel, and provide guidance about debriefing of scenarios. 1 1/2 days effort, $1,500/day

B. Other Personnel:

Robert Cheng, MEng. Assistant Staff, Collab manager, SUMMIT. He will arrange for (either purchase or re-assign) computer equipment at the HS and MS venues where the research will be done. He interacts with Forterra to maintain the software versions, and manage firewall issues. He arranges video conferences among the research team, and is a demonstrator of the technology for SUMMIT's many visitors. 10%effort, 12 months

Kingsley Willis, BA, Assistant Staff, Digital Web Artist, SUMMIT. He will develop further the SiMErgency project website to facilitate intra-team communication, and to provide external recognition of this important project. He will document photographically selected events, and post these to the website. He assists in the development of presentations, posters, signage and publications. 10% effort, 12 months

C. Equipment: Five computers, 1GB RAM and Graphics card, individual headsets, game controllers, $7,500

D. Travel:

$4,000 will be allocated for travel to Stockholm (WGLN meeting to present results), and $2,500 for two persons to attend a West-coast meeting (MMVR) and an East-coast meeting (Evista 2007), for presenting results.

E Participant support/Stipends:

$3,000 will be allocated for incentives for study participants.

F. Other Direct Costs:

$1.370 is allocated to materials, publications/dissemination and computer services including costs for HS and MSfirewall management.

G. Forterra Systems, Inc. Development Costs:

$19,000 is allocated for design, development, production, and operation support, $25,000 for art assets and animations,$5,000 for engineering, and $1,000 for audio, a total of $50,000 Sub-contract basis. This development is warranted to provide the settings, assets, and the animations that support the medical school environment required by the Swedish IRB, and will provide test environments that have not been seen previously by the HS students during the instruction phase. In SiMErgency I, we paid $20,000, and Forterra provided an additional $100,000 of project support as an investment. Also, SiMErgency II is deriving benefit from the re-use of properties that are funded by another SUMMIT/Forterra projects.

Finance administrator (Stanford): Lora Pertle, Director of Finance and Admin., Information Resources and Technology (IRT), Stanford University School of Medicine; p.650.723.0362, f.650.725.4415, e. lpertle@stanford.edu

Appendix 2:

- UMEÅ Co-PI's One-page CV

NAME	POSITION TITLE:
Leif Hedman	Research scientist, Department of Psychology, Director for Skill Acquisition Lab, Umeå University Affiliated Senior Researcher at the Center for Advanced Medical Simulation, Karolinska Institutet

PROFESSIONAL EXPERIENCE

Thesis 1978 at University of Lund, Sweden, within the field of neuropsychology, in particular on transient changes of waveform of Event-Related Potentials in man during selective listening. Associate professor in psychology 1985 at Lund University. Worked during 1986-1999 as an industrial researcher and Director of Research for Human Factors at Telia Research AB, and has an experience as Swedish project leader in several international R&D projects:

- R1067 GUIDANCE. in EU-RACE1 (Phase 1 of Research and Development in Advanced Communications in Europe) during 1987-1994.
- EURESCOM P802 - Strategic study into sustainability with respect to social and economic impacts of telecommunication services", during 1998.
- Research Director for Skill Acquisition Lab at the Department Psychology, Umeå University, 2000-2006.

Honors and Major Advisory Committees

1991-2 External Reviewer of EURESCOM (European Institutet for Research on Strategic Studies in Telecommunications GmbH, in Heidelberg) reports within the area "The impacts of telework on sustainable social development and quality of life".

Students at Umeå University and KI

PhD advisor for two students at KI

Advisor for numerous BSc students and for three PHD students at Umeå university.

Teaching

Since 1971 a lecturer and researcher within the areas of cognitive psychology, Human Factors, Human Computer Interaction, work psychology and Technical psychology, at the Universities of Lund, Luleå, Umeå, Stockholm and Växjö in Sweden.

Selected Publications – since 2002

Sharafi P, Hedman L, & Montgomery H. Using information technology: Engagement modes, flow experience, and personality orientation. 2002 *Computers in Human Behavior, 22*, 5, pp. 899-916.

Hedman L, & Sharafi P. (2004). Early use of Internet-based educational resources: Effects on students´ engagement modes and flow experience. *Behaviour & Information Technology, 23*, 2, pp. 137-146.

Hedman L. (2002). Engagement modes and flow in using PDAs, Chapter 4.4 in K. Lundby (Ed.). *KNOWMOBILE: Knowledge access in distributed training. Mobile opportunities for medical students. InterMedia Report 5*. University of Oslo: InterMedia and Unipub forlag, pp. 189-224.

Ström P, Kjellin A, Hedman L, Johnsson E, Wredmark T, & Fellander-Tsai L. (2003). Validation and learning in the Procedicus KSA Virtual Reality surgical simulator: implementing a new safety culture in medical school. *Surgical Endoscopy,17*, pp.227-231.

Hedman L, Klingberg T, Kjellin A, Wredmark T, Enochsson L, & Felländer-Tsai L. (2006) Working Memory and Image Guided Surgical Simulation. *Studies in Health Technology and Informatics.119*, pp. 188-193.

Hedman L, Wallin C-J, & Felländer-Tsai L. (2006). Goal-oriented team training using a Human Patient Simulator: Gender-specific engagement modes, self-efficacy and flow experiences. Submitted to *Medical Education*.

Wallin C-J, Hedegård J, Hedman L, Meurling L, & Felländer-Tsai L. Goal-oriented team training using a patient simulator: effects on attitude and behaviour. Submitted to *Medical Education*.

Winberg TM, & Hedman L. Student attitudes towards learning, level of pre-knowledge and instruction type in a computer-simulation: effects on flow experiences and perceived learning outcome. Submitted to *Journal of Research in Science Teaching.*

Maxhall M, Hedman L, Sondell B, Backman A, Holmlund K, & Bucht G. A virtual environment's possibility to influence empathy on caregiver personal. Submitted to *CyberPsychology and Behavior*.

BIOGRAPHICAL SKETCH	
NAME	**POSITION TITLE**
William LeRoy Heinrichs, MD, PhD.	Prof. and Chair (Emeritus, Active), Obstet & Gynecology

EDUCATION

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
Southwestern State University, Okla	B.Sci.	1954	Biology / Chemistry
Univ. Oklahoma School of Medicine	M.D.	1958	Medicine
Univ. Oregon Medical Sciences Univ.	M.S.	1965	Biochemistry (Steroids)
Univ. Oregon Medical Sciences Univ.	Ph.D.	1967	Biochem. (Mixed-function Oxidases)

PROFESSIONAL TRAINING:

1958-1959 Rotating Intern, St. Anthony Hospital, Oklahoma City, OK(affiliate U. of Okla.)
1959-1961 Assistant Resident in Obstetrics and Gynecology, Harper Hospital, Detroit, MI
1961-1962 Senior Resident in Obstetrics and Gynecology, Harper Hospital, Detroit, MI (affiliate of Wayne State University School of Medicine)

RESEARCH AND/OR PROFESSIONAL EXPERIENCE:

1965-1967 Clinical Assistant Professor, Department of Obstetrics and Gynecology, Univ. of Oregon School of Medicine, Portland, OR
1967-1969 Assistant Professor of Obstetrics and Gynecology, Univ. of Washington School of Medicine, Seattle, WA
1969-1972 Associate Professor of Obstetrics and Gynecology, Univ. of Wash. Sch. of Med.
1972-1976 Professor of Obstetrics and Gynecology, Univ. of Wash. School of Medicine
1976-1984 Professor and Chairman, Department of Gynecology and Obstetrics, Stanford University School of Medicine, Stanford, CA
1976-1984 Chief of Service, Department of Gynecol & Obstet, Stanford University Hospital
1976-1984 Member, Executive Committee, Stanford University School of Medicine
1976-1984 Member, Clinical Advisory Committee, Stanford University Hospital
1984-1994 Professor of Obstetrics and Gynecology, Stanford University of Medicine
1985-1994 Director of Gynecology, Department of Gynecology and Obstetrics
1994-present Professor and Chairman (Emeritus, Active 1999), Dept. Obstet; & Gynecol Assoc.Dir.SUMMIT, & Dir.Surgical Simulation, Stanford Univ. Sch. of Med.

HONORS (Selected):

1958 Medical Degree with Honors: Student Research Achievement Award (Biochemistry)
1966 Appointment as Josiah Macy, Jr. Faculty Fellow
1970 President's Award, Am. College of Obstet. and Gynecol. (Estrogen Receptors in Brain)
1979-1981 Chairman, PHS (NIH); Study Section, Human Embryology and Development (HED)
1999 Keynote Speaker, IEEE/CBMS, "From Slices to Surgical Simulation: What Do Surgeons Want?", June '99, Stamford, CT
2000 • Finalist, Pirelli Foundation INTERNETional Award, Edition V, April; http://summit.stanford.edu/ourwork/PROJECTS/LUCY/lucywebsite/
2002 • Recipient, Satava Award, Medicine Meets Virtual Reality, Jan., Newport Beach,
• Exhibitor, Future Centrum, Telecom Italia, Opening Sept. 12th, Venice, Italy
• Keynote Speaker, Whither Surgical Training?, Univ. West. Austr; Sept.26th

PUBLICATIONS: Refereed reports (most recent):

• Heinrichs WL, Srivastiva S, Chase, Dev P RA,. *Lucy2.6;* A 3D Pelvic Model for Surgical Simulation. *J Am Ass'n Gynecol Laparos.* August 2004, Vol. 11, No. 3, 326-331

• Heinrichs WL, Srivastava S, Montgomery K, and Dev P. The fundamental manipulations of surgery: A structured vocabulary for designing surgical curricula and simulators. Special Article; *J Amer Ass'n Gynecol Lapar* November 2004, Vol. 11, No. 4, 450–456.

• Youngblood P, Srivastava S, Curet M, Heinrichs WL, Dev P, Wren S. Comparison of Training on Two Laparoscopic Simulators and Assessment of Skills Transfer to Surgical Performance, *J Am Coll Surg*. 2005 Apr;200(4):546-51.

• Srivastava S, Harter P, Wallin, Youngblood P, Hedman L, Fellander-Tsai L, Heinrichs WL. A Virtual 3D World for Team Training in Emergency Medicine Crisis Resource Management (EMCRM) Submitted to *JSurgSIM* 2006

CV Li Felländer-Tsai

Born 1965 in Stockholm, Sweden, (Married, three children born 1995, 1997 and 1999)

A. Education

MD, PhD Karolinska Institutet, Associate professor Karolinska Institutet
Visiting Fellow Childrens Hospital, Harvard, Boston 1996
Medical management program Stockholm School of Economics 2001-2002 (6 weeks Executive education)

B. Current appointment

Chairman, Department of Clinical Science Intervention and Technology (CLINTEC), Karolinska Institutet
Director, Center for Advanced Medical Simulation at Karolinska University Hospital and Karolinska Institutet
Senior consultant Orthopedics at Karolinska University Hospital, Huddinge
Senior lecturer in Orthopedics at Karolinska Institutet

C. Other relevant qualifications:

2004	Organizer of the State of the Art meeting at Karolinska Instutitet. The topic of the meeting was "Advanced medical simulation, a systematic approach – shortening the learning curve"
2004	Organized the annual meeting of The Society in Europe for Simulation Applied to Medicine (SESAM) at the Karolinska Institutet
2002	Chaired the Multidisciplinary Curriculum Committee for Establishing Basic Accreditation in image guided intervention with profiency levels in advanced surgical simulators at Huddinge University Hospital
1998-	Responsible for the orthopedic course and endoscopic simulator training within the course in Surgery (8´th semester) at Karolinska Institutet at Huddinge University Hospital
1994-2001	Course leader for 12 elective courses in Trauma Care, Sports Orthopedics and Orthopedic Trauma Care, Karolinska Institutet Course leader of 3 postgraduate courses at Karolinska Institutet (University pedagogics 2001 and Advanced Medical Simulation evidence based training for improved patient safety 2003 and 2004)
2001	Awarded the Pedagogical Prize at Karolinska Institutet

Relevant Publications – selected

1) Working Memory and Image Guided Surgical Simulation.
Leif Hedman, Torkel Klingberg, Ann Kjellin, Torsten Wredmark, Lars Enochsson and Li Felländer-Tsai. Stud Health Technol Inform. 2005;119:188-193.
2) Assessment of team training using Engagement Modes and Self Efficacy *CJ Wallin, Felländer-Tsai L, Hedman L.* Karolinska Institutet Annual Educational Meeting 2005, Stockholm
3) Goal-oriented team training using a patient simulator; effects on attitude and behaviour
Wallin CJ, Hedegård J, Hedman L, Meurling L, Felländer-Tsai L (Submitted)
4) Advanced virtual reality (VR) simulators in medicine. Teaching a concern for safety.
E Johnson, A Kjellin, T Wredmark L Felländer-Tsai. Eur J Sports Traumatol Rel Res, 23:183-184 (2001)
5) Validation and learning in the Procedicus KSA Virtual Reality surgical simulator: implementing a new safety culture in medical school. *P Ström, A Kjellin, L Hedman, E Johnsson, T Wredmark, L Felländer-Tsai*. Surgical Endoscopy Feb;17(2):227-31 (2003)
6) Training in tasks with different visual-spatial components does not improve virtual arthroscopy performance.
Ström P, Kjellin A, Hedman L, Wredmark T, Felländer-Tsai L Surg Endosc. 2004 18:115-20
7) Evaluating instruction of medical students with a haptic surgical simulator – the importance of coordinating students' perspectives. *Ericka Johnson, Pär Ström , Ann Kjellin , Torsten Wredmark, Li Felländer*-Tsai. J Information Technology in Healthcare, 2004; 2(3): 155-163.
8) Visuospatial skills and computer game experience influence the performance of virtual endoscopy.
Enochsson L, Isaksson B, Tour R, Kjellin A, Hedman L, Wredmark T, Tsai-Fellander L
J Gastrointest Surg. 2004 Nov;8(7):876-82; discussion 882
9) Effect of Visual-Spatial Ability on Total Performance Score in Endoscopic Simulation Training Leif *Hedman, Pär Ström, Pehr Andersson, Ann Kjellin, Torsten Wredmark, Li Felländer-Tsai* In press Surg Endosc 2006.

NAME	POSITION TITLE
William LeRoy Heinrichs, MD, PhD.	Prof. and Chair (Emeritus, Active), Obstet & Gynecology

EDUCATION

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	FIELD OF STUDY
Southwestern State University, Okla	B.Sci.	1954	Biology / Chemistry
Univ. Oklahoma School of Medicine	M.D.	1958	Medicine
Univ. Oregon Medical Sciences Univ.	M.S.	1965	Biochemistry (Steroids)
Univ. Oregon Medical Sciences Univ.	Ph.D.	1967	Biochem. (Mixed-function Oxidases)

PROFESSIONAL TRAINING:

1958-1959 Rotating Intern, St. Anthony Hospital, Oklahoma City, OK(affiliate U. of Okla.)
1959-1961 Assistant Resident in Obstetrics and Gynecology, Harper Hospital, Detroit, MI
1961-1962 Senior Resident in Obstetrics and Gynecology, Harper Hospital, Detroit, MI (affiliate of Wayne State University School of Medicine)

RESEARCH AND/OR PROFESSIONAL EXPERIENCE:

1965-1967 Clinical Assistant Professor, Department of Obstetrics and Gynecology, Univ. of Oregon School of Medicine, Portland, OR
1967-1969 Assistant Professor of Obstetrics and Gynecology, Univ. of Washington School of Medicine, Seattle, WA
1969-1972 Associate Professor of Obstetrics and Gynecology, Univ. of Wash. Sch. of Med.
1972-1976 Professor of Obstetrics and Gynecology, Univ. of Wash. School of Medicine
1976-1984 Professor and Chairman, Department of Gynecology and Obstetrics, Stanford University School of Medicine, Stanford, CA
1976-1984 Chief of Service, Department of Gynecol & Obstet, Stanford University Hospital
1976-1984 Member, Executive Committee, Stanford University School of Medicine
1976-1984 Member, Clinical Advisory Committee, Stanford University Hospital
1984-1994 Professor of Obstetrics and Gynecology, Stanford University of Medicine
1985-1994 Director of Gynecology, Department of Gynecology and Obstetrics
1994-present Professor and Chairman (Emeritus, Active 1999), Dept. Obstet; & Gynecol Assoc.Dir.SUMMIT, & Dir.Surgical Simulation, Stanford Univ. Sch. of Med.

HONORS (Selected):

1958 Medical Degree with Honors: Student Research Achievement Award (Biochemistry)
1966 Appointment as Josiah Macy, Jr. Faculty Fellow
1970 President's Award, Am. College of Obstet. and Gynecol. (Estrogen Receptors in Brain)
1979-1981 Chairman, PHS (NIH); Study Section, Human Embryology and Development (HED)
1999 Keynote Speaker, IEEE/CBMS, "From Slices to Surgical Simulation: What Do Surgeons Want?", June '99, Stamford, CT
2000 • Finalist, Pirelli Foundation INTERNETional Award, Edition V, April; http://summit.stanford.edu/ourwork/PROJECTS/LUCY/lucywebsite/
2002 • Recipient, Satava Award, Medicine Meets Virtual Reality, Jan., Newport Beach,
• Exhibitor, Future Centrum, Telecom Italia, Opening Sept. 12th, Venice, Italy
• Keynote Speaker, Whither Surgical Training?, Univ. West. Austr; Sept.26th

PUBLICATIONS: Refereed reports (most recent):

• Heinrichs WL, Srivastiva S, Chase, Dev P RA,. *Lucy2.6;* A 3D Pelvic Model for Surgical Simulation. *J Am Ass'n Gynecol Laparos.* August 2004, Vol. 11, No. 3, 326-331

• Heinrichs WL, Srivastava S, Montgomery K, and Dev P. The fundamental manipulations of surgery: A structured vocabulary for designing surgical curricula and simulators. Special Article; *J Amer Ass'n Gynecol Lapar* November 2004, Vol. 11, No. 4, 450–456.

• Youngblood P, Srivastava S, Curet M, Heinrichs WL, Dev P, Wren S. Comparison of Training on Two Laparoscopic Simulators and Assessment of Skills Transfer to Surgical Performance, *J Am Coll Surg*. 2005 Apr;200(4):546-51.

• Srivastava S, Harter P, Wallin, Youngblood P, Hedman L, Fellander-Tsai L, Heinrichs WL. A Virtual 3D World for Team Training in Emergency Medicine Crisis Resource Management (EMCRM) Submitted to *JSurgSIM* 2006

CV Li Felländer-Tsai

Born 1965 in Stockholm, Sweden, (Married, three children born 1995, 1997 and 1999)

A. Education

MD, PhD Karolinska Institutet, Associate professor Karolinska Institutet
Visiting Fellow Childrens Hospital, Harvard, Boston 1996
Medical management program Stockholm School of Economics 2001-2002 (6 weeks Executive education)

B. Current appointment

Chairman, Department of Clinical Science Intervention and Technology (CLINTEC), Karolinska Institutet
Director, Center for Advanced Medical Simulation at Karolinska University Hospital and Karolinska Institutet
Senior consultant Orthopedics at Karolinska University Hospital, Huddinge
Senior lecturer in Orthopedics at Karolinska Institutet

C. Other relevant qualifications:

2004	Organizer of the State of the Art meeting at Karolinska Instutitet. The topic of the meeting was "Advanced medical simulation, a systematic approach – shortening the learning curve"
2004	Organized the annual meeting of The Society in Europe for Simulation Applied to Medicine (SESAM) at the Karolinska Institutet
2002	Chaired the Multidisciplinary Curriculum Committee for Establishing Basic Accreditation in image guided intervention with profiency levels in advanced surgical simulators at Huddinge University Hospital
1998-	Responsible for the orthopedic course and endoscopic simulator training within the course in Surgery (8´th semester) at Karolinska Institutet at Huddinge University Hospital
1994-2001	Course leader for 12 elective courses in Trauma Care, Sports Orthopedics and Orthopedic Trauma Care, Karolinska Institutet Course leader of 3 postgraduate courses at Karolinska Institutet (University pedagogics 2001 and Advanced Medical Simulation evidence based training for improved patient safety 2003 and 2004)
2001	Awarded the Pedagogical Prize at Karolinska Institutet

Relevant Publications – selected

1) Working Memory and Image Guided Surgical Simulation.
Leif Hedman, Torkel Klingberg, Ann Kjellin, Torsten Wredmark, Lars Enochsson and Li Felländer-Tsai. Stud Health Technol Inform. 2005;119:188-193.
2) Assessment of team training using Engagement Modes and Self Efficacy *CJ Wallin, Felländer-Tsai L, Hedman L.* Karolinska Institutet Annual Educational Meeting 2005, Stockholm
3) Goal-oriented team training using a patient simulator; effects on attitude and behaviour
Wallin CJ, Hedegård J, Hedman L, Meurling L, Felländer-Tsai L (Submitted)
4) Advanced virtual reality (VR) simulators in medicine. Teaching a concern for safety.
E Johnson, A Kjellin, T Wredmark L Felländer-Tsai. Eur J Sports Traumatol Rel Res, 23:183-184 (2001)
5) Validation and learning in the Procedicus KSA Virtual Reality surgical simulator: implementing a new safety culture in medical school. *P Ström, A Kjellin, L Hedman, E Johnsson, T Wredmark, L Felländer-Tsai*. Surgical Endoscopy Feb;17(2):227-31 (2003)
6) Training in tasks with different visual-spatial components does not improve virtual arthroscopy performance.
Ström P, Kjellin A, Hedman L, Wredmark T, Felländer-Tsai L Surg Endosc. 2004 18:115-20
7) Evaluating instruction of medical students with a haptic surgical simulator – the importance of coordinating students' perspectives. *Ericka Johnson, Pär Ström , Ann Kjellin , Torsten Wredmark, Li Felländer*-Tsai. J Information Technology in Healthcare, 2004; 2(3): 155-163.
8) Visuospatial skills and computer game experience influence the performance of virtual endoscopy.
Enochsson L, Isaksson B, Tour R, Kjellin A, Hedman L, Wredmark T, Tsai-Fellander L
J Gastrointest Surg. 2004 Nov;8(7):876-82; discussion 882
9) Effect of Visual-Spatial Ability on Total Performance Score in Endoscopic Simulation Training Leif *Hedman, Pär Ström, Pehr Andersson, Ann Kjellin, Torsten Wredmark, Li Felländer-Tsai* In press Surg Endosc 2006

UMEÅ UNIVERSITET
Department of psychology
Hedman

April 4, 2006

Wallenberg Global Learning Network II

Dear Selection Committee:

It is with great satisfaction I and my co-workers have worked with the second year proposal on the Wallenberg Global Learning Network project "SiMErgency II: Validation of Virtual Worlds for Teaching the New CPR".

The combination of the simulation technique developed at Forterra and our knowledge of Human Factors design and evaluation in Umeå has evolved into a true joint project that is very stimulating to work in. I am convinced that the developed technique in combination with the results and experiences achieved from the ongoing and planned projects will contribute to better learning outcomes in the form of development and better understanding of new CPR procedures in high school curricula.

I will commit 33% effort to this project as a part of my employment at Umeå University. Please contact me if you should have any questions.

Sincerely,

Leif Hedman, PhD, Associate Professor

Department for Clinical Science, Intervention and Technology
Li Tsai, Chairman

Wallenberg Global Learning Network II

To the Selection Committee,

It is with great pleasure and honour that I and my co-workers have worked with the second year project proposal to the Wallenberg Global Learning Network. The title of the project is "SiMErgency II: Validation of Virtual Worlds for Teaching the New CPR".

The collaboration between Stanford University, Umeå University and Karolinska Institutet is experienced as highly relevant at both Karolinska Institutet, Karolinska University Hospital and Huddinge High School. Karolinska Institutet has a long tradition of collaboration with Huddinge High School and we thus have unique possibilities to implement modern health care education and training in high school education. We feel that this will promote the interest in health care in general and not only medicine in particular.

The simulation techniques developed at Forterra and our engagement in Human Factors design and evaluation have become a very valuable joint project, highly relevant for education and training in critical care management at Huddinge High School and also for students on the professional level within health care.
I feel convinced that the developed technique in combination with the results and experiences achieved from the ongoing and planned projects will contribute to better learning outcomes in the form of development and better understanding of new CPR procedures in high school curricula. The technique allows the practice of correct behaviour and attitudes in combination with application of correct knowledge and collaborative skills.

I and my collaborators at Karolinska Institutet and Huddinge High School will be highly committed to the task of fulfilling the objective.

Sincerely yours,

Li Felländer-Tsai
MD, PhD
Associate professor

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SiMErgency II, a Wallenberg project; 4/4/06
PI – Wm. LeRoy Heinrichs, MD, PhD

This project is an important activity at SUMMIT where we develop cutting-edge learning technologies. As SUMMIT has pioneered the use of virtual worlds for training in medical topics, we are finding broad and penetrating interest – indeed, our workshops on Simulation and Games in Medicine, are well subscribed, and another is offered – http://simworkshop.stanford.edu . We have developed a strong relationship with the Forterra team through an SBIR (Small Business Innovation Research) focused on First Responders to CBRNE events, and are requesting additional funding for training physician assistants by using this learning technology.

I am strongly convinced that the X and the Y-generations of students, all 'digital natives' in today's schools, colleges, and universities, will benefit from learning useful content with these methodologies that currently offer primarily entertainment value for many. The direction of SiMErgency II to address social and cultural issues is of particular interest, and possibly, value. Further, issues of harassment in the workplace, and other sensitive topics can be addressed with virtual worlds technology. I am very appreciative of the WGLN reviewers and Board, for sharing this vision, and funding this development and research work. We are strongly committed to this project, and the collaboration we enjoy.

Wm. LeRoy Heinrichs, MD, PhD
Professor (Emeritus, Active) and Past Chair of Ob/Gyn
Associate Director, SUMMIT

HUDDINGE KOMMUN
Huddingegymnasiet

24/03/2006

Wallenberg Global Learning Network (WGLN)

Re:
WGLN2 - SiMErgency I:
A Web-based Simulation of Medical Emergencies
for Training High School Students

Huddinge High School is engaged in a collaboration with Karolinska Institutet in the development of A Web-based Simulation of Medical Emergencies
for Training High School Students.

We support a new grant application for further validation.

Sincerely yours,

Ylva Lokander
Deputy principle

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