Chapter 12
Using Effect Size for Group Modeling in E-Learning Systems

Divna Krpan
University of Split, Croatia

Suzana Tomaš
University of Split, Croatia

Roko Vladašić
University of Split, Croatia

ABSTRACT
There is great need for collaboration in education and e-learning systems which imply the necessity for group modeling. Since Bloom’s experiment, which produced effect size of 2-sigma, there were many attempts to repeat those results with intelligent tutoring systems. Our experiments show effectiveness of xTEx-Sys in measure of effect size. The goal of our research and development is to get as close as possible to effect size of 2-sigma. There is greater need for collaboration in e-learning systems and there are some indications that collaboration could increase effectiveness. Since collaboration is closely coupled with groups, directions for future development and exploration of e-learning systems lay in field of group modeling. Group modeling also implies creation of stereotype models.

INTRODUCTION
There is a gap between knowledge and skills that students acquire in school and those required in business. To bridge that gap, additional learning is required. Development of industry and business imply lifelong learning and teaching process. Since traditional instruction is expensive and dependant on specific restraints, for example, time, place and location, it is necessary to search for easier solutions. E-learning could be the answer. With increasing availability of the Internet, high speed and bandwidth, and rapid development of computer technology, it is more convenient to deliver content to students at distance.

Some authors define e-learning as an interactive learning in which learning content is available online and provides automatic feedback to the student’s learning activities, but online communication between participants (students and teachers, or between students) doesn’t have to be included, so the main focus is on learning content (Paulsen, 2002).
The e-learning includes different ways of delivering educational content: via Internet (LAN and WAN), audio and video tape, CD-ROM, interactive TV, satellite broadcasting. It covers applications and processes such as computer-based learning, virtual classrooms, Web-based learning and digital collaboration.

E-learning can be delivered in two ways: synchronously and asynchronously (IsoDynamic, 2006). Synchronous e-learning (Erudium, 2001) takes place in virtual classroom. It is based on a simultaneous access of instructors and all other participants to content, in real time; it may include Web-based videoconferencing, audio conferencing and online chat. In synchronous mode, e-learning has no space constraints, but time constraints are present because learning is done at precise appointments between instructors and students. Asynchronous e-learning may take place at any time, and is self paced, it refers to learning methods in which student and teacher interact with each other one at a time, in turn. Asynchronous e-learning is probably more interesting because of its lower cost of development and reusable components and it eliminates all time and location related constraints. In asynchronous e-learning teacher and student are not active or online at same time (examples of activities are: e-mail, forums, newsgroups, etc.) (Erudium, 2001).

Advances in Internet access speed and availability of personal computing platforms have increased opportunities for use of e-learning technologies (Collier, 2002). The technology infrastructure must support users and network and provide open environment to support interoperability between components, and also security to protect distributed users and content.

A special class of asynchronous e-learning systems are Intelligent Tutoring Systems (ITSs) that represent an advanced learning and teaching environment adaptable to individual student’s characteristics (Stankov, et al., 2008). The ITSs are intended to emulate one teacher interacting with one student more directly (IsoDynamic, 2001). They model how a teacher would teach in the class and also keep track of student’s performance (Jain, 2008). The intelligent tutoring system (ITS) can be defined as a learning technology that dynamically adapts learning content to needs and preferences of the student and learning (Erudium, 2001).

Rickel (1989) presents the following components of the ITS: (i) learning scenario, (ii) domain knowledge representation, (iii) student modeling, (iv) pedagogical knowledge, and (v) user interface. Those components are sometimes different, according to different authors. For example, Shute and Psotka (1995) point out that the ITS must have: (i) knowledge of the domain (expert model), (ii) knowledge of the learner (student model), and (iii) knowledge of the teaching strategies (tutor).

In 1982, Sleeman and Brown (1982) reviewed the state of the art in computer aided instruction and first coined the term Intelligent Tutoring System. They used the term student model for describing an abstract representation of the student or learner, within the computer program. Student modeling is the process of collecting and representing information about the student. Student learns from the ITS while solving problems tailored according to student abilities (previously recorded by the ITS in “student model”). System must behave intelligently or, more specifically, it must be able to accurately diagnose students’ knowledge and skills, decide what to do next and adapt instruction (Shute & Psotka, 1995). Intelligence in the ITS is based on artificial intelligence (AI) techniques. The process of student modeling includes diagnosis of student’s knowledge, but different ITSs use different student modeling techniques. Based on the input and structural properties of student model, it can be classified using three dimensions (VanLehn, 1998):

1. Bandwidth – represents categorization of the amount and quality of student’s input or approximation of student’s mental states while solving problem;
Related Content

Building Student Engagement Through Collaborative Practice in Business Management Education

Web Based Authoring for Virtual Worlds using PIVOTE
[www.igi-global.com/chapter/web-based-authoring-virtual-worlds/53498?camid=4v1a](www.igi-global.com/chapter/web-based-authoring-virtual-worlds/53498?camid=4v1a)

Avatar-Based Group Discussions in Virtual Worlds: Facilitation, Communication Modalities, and Benefits of Participation (Book Chapter Enhancement)
[www.igi-global.com/article/avatar-based-group-discussions-in-virtual-worlds/210432?camid=4v1a](www.igi-global.com/article/avatar-based-group-discussions-in-virtual-worlds/210432?camid=4v1a)

An Integrated Framework for Personalized T-Learning
Francesco Bellotti, Matteo Pellegrino, Ioannis Tsampoulatidis, Stefanos Vrochidis, Pascal Lhoas, Giancarlo Bo, Alessandro De Gloria and Ioannis Kompatsiaris (2010). *Teaching Cases Collection* (pp. 118-135).
[www.igi-global.com/chapter/integrated-framework-personalized-learning/42163?camid=4v1a](www.igi-global.com/chapter/integrated-framework-personalized-learning/42163?camid=4v1a)