Personal Pedagogy Statement

Belief About Teaching and Learning

In my belief, learning is a process of acquiring knowledge and cognitive skills. Bloom (1956) describes learning as 6 different levels: knowledge, comprehension, application, analysis, synthesis and evaluation. Duffy & Jonassen (1992) describes learning as 3 stages: introductory knowledge acquisition, advanced knowledge acquisition and expertise. From a cognitive perspective, the development of a skill can be distinguished among 3 stages (Anderson, 1983; Fitts & Posner, 1967): the cognitive stage, in which declarative knowledge is encoded; the associative stage, in which procedural knowledge is established; the autonomous stage, in which the procedure becomes automated.

No matter how the process of learning is divided, it is common that different pedagogies should be employed for different stages. Duffy et al. (1992) suggests that knowledge acquisition is useful during initial stages. As the learner reaches an advanced stage, learning is with less well-structured domains, in which apprenticeship or coaching is preferred. In the final stages of learning, the learner needs to hone his/her expertise with own experience.

Pedagogy of My Choice

Learning is simpler in earlier stages, where the learner’s task is acquisition of

declarative knowledge and establishment of procedural knowledge. This goal can be achieved by taking information, practicing routines and taking feedback. This well-structured nature of learning gives rise to automated teaching machines. With the amazing advancement of technology, computer has been used as an essential tool to develop systems for different needs of users. Systems known as Intelligent Tutoring Systems (ITSs) are computer programs that can diagnose problems and provide individualized tutoring for learners. On the opposite of constructivist theory which stresses “learning by doing” or “learning by design” (Duffy, et al. 1992), ITS designers stress “learning by being told.” (Michalski & Chilausky, 1980)

In my EPSY 317 and EPSY 374 classes, I explored and evaluated the latest version of algebra tutor, Miss. Lindquist, which is one of the ACT systems (Anderson, Boyle, Corbett & Lewis, 1990). Empirical studies showed that students were learning skills in production-rule units and that the best tutorial interaction style was one in which the tutor provides immediate feedback, consisting of short and directed error messages (Anderson, Corbett, Koedinger & Pelletier, 1995). A formative evaluation showed that students using Miss. Lindquist did better on the post test comparing with those using traditional computer aided instruction (Heffernan, 2001).

From my hands-on exploration, I was deeply impressed by Miss. Lindquist’s effectiveness and efficiency in teaching writing algebraic expressions from word questions. The design of this software features tracing student’s production rules and

providing immediate error feedback. A future software developer and instructional designer, I will develop cognitive tutors and integrate cognitive tutors into my curricula

Current Issues and Discussion

Practice and deployment has been the major problem for cognitive tutors. According to Anderson et al. (1995), cognitive tutors have achieved expected results in lab environments, where “we have designed our programming tutors to deliver just the material we want to teach; we have total control over our classroom; we are working with relatively mature students who come in on their own time and are generally familiar with computers; and we expect students in introductory programming courses to display their skills isolated from other students.” Unfortunately, none of these assumptions are satisfied in real schools. Also, classroom setting differs from one to another. Therefore, Anderson’s cognitive tutors don’t have their own curricula. In stead, these tutors have been used as a tool or a resource to support any existing curricula (Anderson, et al. 1995). For example, Miss. Lindquist is targeted at writing algebraic expressions from word questions, yet it does not come with any “writing algebraic expression” curriculum. Any teacher may use Miss. Lindquist as a tool and fit it with their own curriculum. This versatile yet loosely curriculum-integrated role that current cognitive tutors are playing weakens their ability to achieve theoretical outcomes.

Unlike commercial software packages, the purpose of educational software is to promote learning, which is a variable and complex process. My future development of any educational software will be integrated as a component of instructional design. I will use Gagné's instructional design model as my guideline. According to Gagné, Briggs & Wager (1992), instructional design is a systematic approach to designing instruction and instructional materials to achieve specified learning objectives. Key procedures of this model are:

1. Identifying types of learning outcomes
2. Building hierarchy of simple learning outcomes
3. Identifying conditions of learning
4. Selecting media for instruction
5. Designing instructional events that will achieve each learning outcome
6. Formative and summative evaluation

In this model, any instructional media and events, including educational software, are components serving specific learning purposes/outcomes under specific conditions. All these components constitute a tightly integrated curriculum. For example, a cognitive tutor may be employed if it is required to achieve a simple learning outcome (e.g. writing algebraic expressions from word questions); a formative evaluation may suggest that some graphic or animation will promote students' interest and improve the software's effectiveness.

Vision From Design Projects

In EPSY 374, we are developing a cognitive tutor named “TOEFL Grammar Assistant”. The software is targeted to improving the performance in a specific section of TOEFL test for prospective TOEFL examinees. The software serves a specific learning outcome, which is “finding a grammatical error from 4 options in an erroneous sentence based on English grammar rules”. We are also developing a formative and summative evaluation plan toward the goal of improving the software.

Besides its purpose, design and evaluation, this project is also driven by Anderson’s theory of cognitive modeling and intelligent tutoring (Anderson, et al. 1990). The difference from Miss. Lindquist is that our project is design for a specific purpose under specific conditions. We also hope that a larger curriculum of preparing TOEFL test will be developed later, in which our current project will be a component.

Conclusion

My ideal classroom is a highly technology-integrated one. Though a classroom without teachers is impossible, systems like cognitive tutors will play an important role in instruction of certain stages of learning. However, “using technology for technology’s sake” is to be avoided. Instructional design process will dictate technology integration. I will integrate technology only if it is needed by the curriculum. The entire curriculum, not any component of it, is expected to achieve a

certain objective.

Reference

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