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Instructional Technology Adoption of Medical Faculty in Teaching

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Abstract

Despite large investment by higher education institutions in technology for faculty and student use, instructional technology is not being integrated into instructions in the higher education institutions, including medical education institutions. While diffusion of instructional technologies has been reached a saturation point with early adopters of technology, it has remained limited among mainstream faculty. This study explored technology adoption patterns and perceptions of medical faculty about barriers and incentives to technology adoption in teaching.Complete data was obtained from 155 participants by using survey methodology and analyzed on the basis of theories of diffusion of innovation.

Findings provided evidence for limited adoption of relatively new tools associated with instruction into mainstream faculty. Inadequate hardware for students and faculty, lack of reward structure, insufficient traing oppurtunites were identified as major barriers to faculty technology adoption.

Keywords:
Medical Education, Instructional Technology, Diffusion of Innovations

1. Introduction

During the past two decades, a number of reports have called on medical schools to incorporate instructional technology into their educational program in order to meet challenges of medical education [1,2]. Even though the reports of such organizations encourage medical school decision makers to initiate instructional technology programs, medical schools had made limited progress in accomplishing the recommend educational technology goals [3,4].

There are many reasons both technical and societal, why innovative technologies have not been widely adopted, however, the major reason for this lack of utilization is that most university-level technology strategies ignore the central role that faculty play in the change process [5]. Much of the conversation about technology in education continues to focus on products: computers, software, networks and instructional resources [6]. Certainly, adequate technology infrastructure use is a necessary condition for IT integration but major problem is getting faculty to adopt these technologies once they are made available.

Research findings indicate that there are variety factors involved in faculty members' decision to adopt or reject instructional technology in teaching and learning. According to Green's Annual Campus Computing Survey, user support and instructional integration is the most important of all issues surrounding the adoption of instructional technology for

teaching and learning [6]. The interview results with faculty at a mid-sized university in USA indicate that faculty members' attitude and perceived value of IT are the most important factors in faculty member's decision to use or not to use instructional technologies [7]. Results of the study conducted in a medical school also indicate that lack of knowledge, lack of resources, reward systems, faculty development oppurtunities, financial supupport are few of the the barriers that medical faculty face in IT adoption [3].

Diffusion research investigates the factors that influence the diffusion process. Studies of diffusion and adoption help to explain the what, where, and why of technology acceptance or rejection in education [8]. Therefore, Rogers' theory of the diffusion of innovations provides a theoretical framework for present investigation [9].

Diffusion of an Innovation

Rogers' defines an innovation as "an idea or practice or object that is percieved as new by the individual", and diffusion as "the process by which an innovation is communicated though certain channels over time among the members of a social system"[9, p.5].

According to Rogers, an individual's decision about an innovation is not an instantaneous act, rather "the process through which an individual (or other decision-making unit) passes from first knowledge of innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision"[9, p.163]. Rogers' states that individuals in a social system do not adopt an innovation at the same time, a certain percentage of individuals are relatively earlier or later in adopting a new idea. On the basis of innovativeness-the degree to which an individual is relatively earlier in adopting new ideas than other members of a social system, Rogers categorizes adopters into five groups: Innovators, Early Adopters, Early Majority, Late Majority and Laggards (Figure 1).

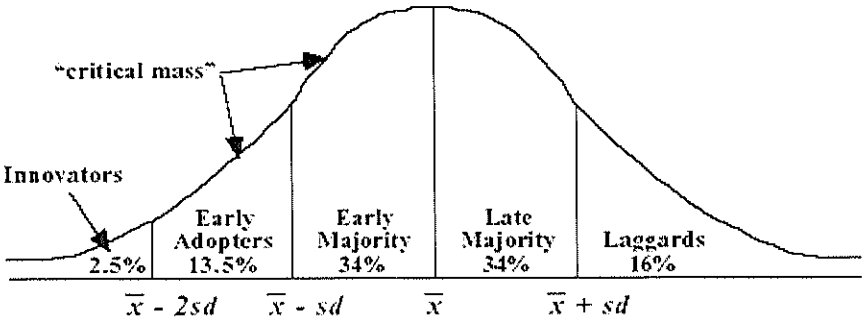

Figure 1. Adopter Categorization on the Basis of Innovativeness (Rogers, 1995)

2. Methodology

The present investigation surveyed medical school faculty members in a state university , who teach in the basic science and clinical science curriculum. Data was gathered about technology use patterns, computer experience, technologies used in teaching, percieved value of IT in medical education, barriers and incentives to adoption, using a survey instrument. Survey items adopted or selected from previous investigations of faculty adoption patterns, teaching and learning with technology [10.11].

The survey was distributed to all faculty members(308) and 50,3 % (155) of the faculty members responded. Of the respondents, 112(72,7%) male and 42(27,3%) female, hold

various academic raks (i.e. 32,7%(50) proffesor, 19,6%(30) Assoc. Proffesor, 22,1%(36) Asst.Proffesor and and 25,6%(39) others and had an avarage 10 years teaching experience. While 23,2%(36) of the respondents teaching in basic science curriculum, the largest group(76,8%(119) teaching in clinical science. While the average age was 41 years, the largest group(≈55%(85) was in between 31-40 years range.

3. Results

Computer Ownership and Amount of Daily Computer Use

Faculty members were asked to indicate if they had a personal computer and internet access at home and at office, and how much time per day they used a computer. Althouh most of the participants (92,5%(135)) have computer at home and at office, only 21,5%(46) indicated that they spent more than 3 hours per day, 13,7%(20) spent less than one hour per day, and 54,8%(80) spent 1 to 3 hours per day.

Faculty Expertise in Technology Use

The faculty rated their level of expertise on eleven types of computer software and tools by using five-point likert-type scale (i.e., 1 for Extensive, 2 for Good, 3 for Fair, 4 for Novice, 5 for None). The majority of faculty (over %90) rated their skills at fair or higher at word procecessing, presentation software, electronic mail, library and database searching, search engines and medline . Most faculties reported their skills at web page creation (76,1%) and statistics packages (54,2%) at novice or none. These findings indicate that faculty mostly use communication and research related tools. Relatively new tools associated with instruction (e.g.Web page creation) were not adopted by majority faculty.

Technologies Used in Teaching

Medical school faculty were asked to indicate which of the 12 instructional technologies they use in teaching-learning process. The mean number of technologies used in teaching is 4,56 with a standard deviation of 1,94. Based on Rogers' adopter categories, the descriptive results indicate that of the 12 instructional technologies, 9 have been used in teaching by more than 16% of the faculty, which means that these technologies have diffused into the Mainstream Faculty(MF). Of the 9 technologies that have been used by Mainstream Faculty(MF), 4 are used by more than 50% of the faculty(i.e. computer+projection 95%, slide projector 75%, overhead 71%, blackboard 66,5%) which indicate that these technologies have diffused into Late Majority(LM). The other 5 technologies have diffused into Early Majority(EM) which represents the segment between 16 and 50 percent of the Rogers' diffusion curve (i.e. Web resources 18,3% ,Video 20,9%, Special Laboratory 22,2%, word processors 33,3%, presentation software 32,7%)(Figure 2).

Percieved Value of IT

The participants used a five-point scale (i.e., 1 for Strongly Agree, 2 for Agree, 3 for Neutral, 4 for Disagree, 5 for Strongly Disagree) to rate their level of agreement on 9 statements about value of IT in medical education. A composite score for each individual faculty was calculated by summing the level of agreement indicated for each of the 9 statement about value of IT. The mean score for Perceived value of IT scale is 11,75 with a standard deviation of 3,4 which indicates that faculty have high level agreement on value of

IT use in medical education. The mean and standard deviation of each item in Perceived Value of IT Scale is presented in Table 1.

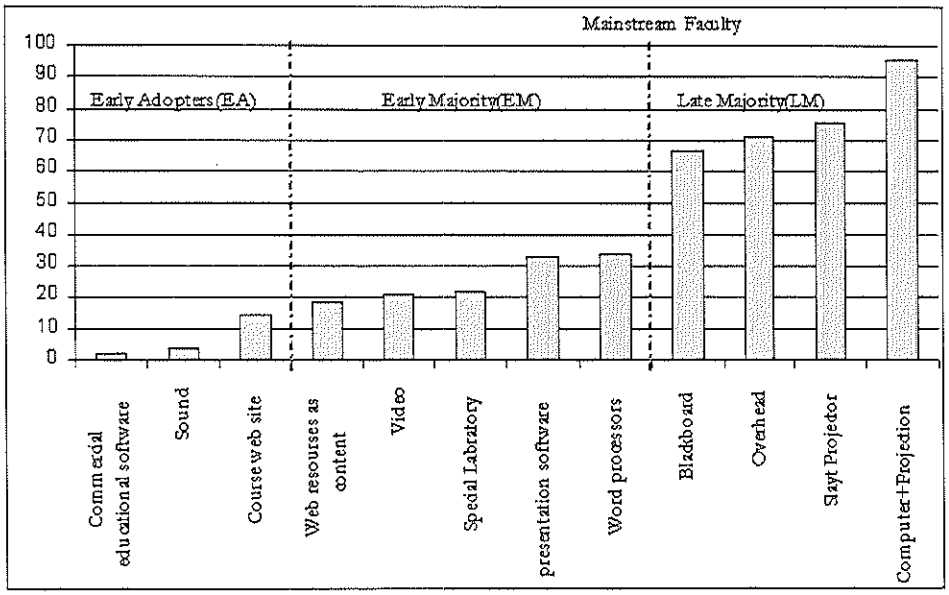

Figure 2. Technologies Used in Teaching

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Table 1. Means and Standard Deviations of Perceived Value of IT Subscale

Items	Mean	SD
Technology enables me to address different learning styles of students	1,57	0,61
ıch as e-mail, enhance my contact with students	1,56	0,69
I think that technology enables learning more effective	1,40	0,58
Technology using increase motivation of students	1,59	0,71
Technology enables me update instructional materials easily	1,29	0,47
Using technology enables me to use my lecture time efficiently.	1,55	0,65
Using technology increase quality of my teaching	1,53	0,59
Using technology increase my productivity as an instructor	1,55	0,65
Technology enables me to reach instructional resources.	1,27	0,47

Perceived Barriers and Incentives to Adoption

In explaining faculty limited adoption of instructional technology, Jacobsen state that "explanation for limited adoption may be found in the many barrier that still constrain use by enthusiastic beginners" [12, p.2].

For the purpose of gathering data about perceived barriers to technology adoption, medical faculty were asked to rate their level of agreement on 20 statements about barriers to adoption. Six factors which were identified as a major barrier to adoption of instructional technology by over 50% of the faculty are 1) lack of computers for students , 2) lack of support service for students, 3) lack of reward structure, 4) lack of computers for faculty, 5) lack of peripherals for faculty and 6) lack of training opportunities (Table 2).

Table 2. Faculty Agreement on Items about Barriers to Adoption.

(SA=Strongly Agree, A=Agree, N=Neutral, D= Disagree, SD=Strongly Disagree)

Items	SA+A (%)	N (%)	SD+D (%)
There is too few computers for students.	68,0	22,0	10,0
There is not enough support for supervising student computer use.	68,5	22,8	8,8
There is no reward structure that recognizes faculty for using technology in teaching and learning.	67,1	19,5	13,4
There is lack of printers and/or other peripherals to effectively use computers for teaching and learning.	61,9	9,0	29,1
There are too few computers for individual faculty.	56,2	9,8	34,0
There are lack of / not enough training opportunities for faculty members to acquire new computer knowledge and skills.	50,6	18,2	31,2

Incentives to Adoption

According to Anderson, Varnhagen & Campbell, "Related to barriers are incentives that help faculty overcome barriers"[10]. In order to explore incentives that motivate faculty for technology use, faculty were asked to rate importance level of 5 statements about incentives for adoption.Items related to investment in infrastructure, training and support, policy and plans of university, and financial support for material development were rated important incentives by over 96% of the faculty. It is interesting to note that only 31,6% of the faculty agreed on that lack of time is a barrier, 71,6% of the faculty rated the item related to providing development time by reducing teaching load as an important incentive. As consistent with agreement on that reward structure is a barrier, 68,4 % of the faculty rated the reward structure recognizing the technology use as an important incentive.

4. Discussion

The findings of this study indicated that even though majority of the medical faculty percieved instuctional technology valuable for teaching and learning, adoption of instructional technology failed to cross mainsteam faculty. Findings provides evidence for widespread adoption of communication and research tools into late majority, and adoption of relatively new tools associated with instruction into early majority.

As stated by Surry, diffusion and adoption can not be base solely on the worth or quality of the innovation rather should be based on the culture, the needs and the demands of the faculty [13]. The medical school faculty in this investigation identified inadequate harware for students and faculty, lack of reward structure, insufficient traing oppurtunites as major

barriers to their technology adoption. Related to the barriers, investment in infrastructure, training and support, policy and plans of university, financial support for material development, reward structure are identified as important factors for a motivating environment in their technology adoption.

5. Conclusions

Medical institutions today confronted with instructional technology innovation, which is transforming the way in which faculty and students interact and the roles they take. If the goal of a medical education institution is the integration of technology for a transformative change, then rather on technology itself, there must be a clear focus on the faculty who use technology. It is essential for administrators, policy makers and anyone interested in an effective teaching and learning in medical education to understand adoption patterns of faculty and how these patterns influence the adoption and diffusion of instructional technology in medical education institution.

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