Use of an Innovation Component Configuration Map to Measure Technology Integration Practices of Higher Education Faculty

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Abstract

This presentation will focus on the use of a custom developed Innovation Component Configuration Map (ICCM) to measure technology integration practices of faculty in Schools, Colleges, and Departments of Education (SCDEs). This study investigated the relationship between the level of technology integration fidelity (high, moderate or low) by SCDE faculty and a) access to adequate support from technological infrastructure, b) access to adequate support from human infrastructure, and c) personal attitude toward computer use.

Introduction

The primary goal of this study was to explore and identify best practices in technology integration by higher education faculty, specifically higher education faculty in Schools, Colleges, and Departments of Education (SCDEs). This research study grew out of a perceived need to identify and contribute to the sparse knowledge base in current literature related to concrete classroom practices in technology integration by higher education faculty in SCDEs (Tharp, 1997; Willis, Thompson & Sadera, 1999). This population is of particular concern given the inherent responsibility and expectation for these faculty to model effective technology integration within their instruction in the preparation of preservice teachers.

Theoretical Background

The literature documents that the preparation for preservice teachers in the area of technology integration is inadequate (e.g., Garcia, 1998; Hannafin, 1999; Moursund & Bielefeldt, 1999; Poole, 1998; Schrum, 1999). There are isolated examples of excellence in technology integration (e.g., Eakin, 1997; Michael, 1998; Persichitte, Caffarella & Tharp, 1999; Studler & Wetzel, 1999). Much of the research literature in technology integration is limited to use of technology rather than on integration of technology in education. Also very little of the technology integration literature focuses on higher education faculty. Previous research (Persichitte et al., 1999) documents the importance of variables that influence technology integration: technological infrastructure, human support infrastructure, and attitude toward computer use. The work of change theorists and diffusion of innovation scholars such as Rogers (1995), Hall and Hord (2001), and Fullan (1993) offers a sound theoretical foundation for further research in the area of technology integration. However, the diffusion rate of technology integration practices among SCDE faculty is very low and hence, the focal point of this research was an investigation of the process of change and diffusion of instructional technology among teacher education faculty. The literature also suggests that although many K-12 schools and higher education settings have established benchmarks or standards for the integration of technology into classrooms, no model or methodology exists for substantiating technology standards with actual classroom practices (Mills, 2001).

Research Questions

The following research questions guided this study.

RQ 1. To what extent do SCDE faculty report examples of technology integration that parallel examples of best practices in the current literature?

RQ 2. To what extent do SCDE faculty report high fidelity, moderate fidelity, or low fidelity technology integration practices in their teaching?

RQ 3. Is there a relationship between level of technology integration fidelity (high, moderate or low) by SCDE faculty and access to adequate support from technological infrastructure?

RQ 4. Is there a relationship between level of technology integration fidelity (high, moderate or low) by SCDE faculty and access to adequate support from human infrastructure?

RQ 5. Is there a relationship between level of technology integration fidelity (high, moderate or low) by SCDE faculty and their personal attitude toward computer use?

Methodology

Instruments

The variables of primary interest in this research study were: technology integration practices, implementation fidelity of technology integration by higher education faculty, attitudes of faculty toward computers, and technological and human infrastructure in support of technology integration. Technology integration practices and implementation fidelity by faculty were measured by an Innovation Component Configuration Map (ICCM) that was custom developed, field tested, and reviewed by experts in the area of technology integration. The Attitudes Toward Computer Usage Scale (ATCUS) (Popovich, Hyde, Zakrajsek, & Blumer, 1987) was utilized to collect data related to computer attitudes of SCDE faculty participants. Information about technological and human infrastructure was obtained from open ended and multiple choice questions included as a part of the Demographic Questionnaire.

Participants and Data Collection Procedures

The focus of this research was higher education faculty members associated with SCDEs. Hence the representative population selected for this study was individual members of the American Association of Colleges of Teacher Education (AACTE). AACTE is the principal professional association for college and university leaders with responsibility for educator preparation. The AACTE 2002 membership list included 5,323 individual members. From the individual membership, 600 faculty were randomly sampled and asked to participate in this study.

To answer the research questions addressed in this study, 600 instrumentation packets (ICCM, ATCUS, and Demographics) were disseminated to members of the American Association of Colleges of Teacher Education (AACTE), via a multi-mode (paper-based, online and e-mail) method. After two follow-up reminders, completed surveys were received from 208 participants resulting in a response rate of 36%. Interestingly, of the 208 participants, 53 responded to the online version, 154 via the paper-based version, and only one participant responded via the e-mail attachment. Of the AACTE members returning completed surveys, 56.7% were female, 91.4% were Assistant, Associate, and Professors with 89.9 % holding a doctorate degree, 99% reported full time employment status, and 95.8% were affiliated with a college or a university. The age group of participant faculty ranged from 20 to 72 years (M = 50.74, SD = 11.57) with teaching experience ranging from 0 to 48 years (M = 25, SD = 8.96).

Results

Research question 1 focused on the technology integration practices of higher education faculty for which the ICCM served as the primary data collection instrument. Results of the analysis indicate that, on an average, 79.1% of the SCDE faculty participants were close to demonstrating best practices in technology integration, and that this mean for ICCM scores was significantly different from the best practice score of 75. The responses on the ICCM were fairly normally distributed with a large variance (M = 79.1, SD = 19.51).

Research question 2 explored the classification of the SCDE faculty into three distinct groups of technology integration fidelity levels. The ICCM allowed for the categorization into three distinct groups, resulting in 56.7% in the high fidelity, 38% in the moderate fidelity, and 5.3% in the low fidelity group. The chi-squared goodness of fit test determined that there were significant differences in the proportions of the three fidelity groups favoring high fidelity.

Research questions 3, 4, and 5 explored the relationships between six predictor variables (four factors

of the ATCUS, technological and human support available to faculty) and technology integration fidelity levels (dependent variable). A multinomial logistic regression analysis predicted the relationship among the set of predictor variables and the dependent variables to be significant. Slightly over 58% of the participants were correctly classified by fidelity. However, ATCUS factor 2 (Positive Reactions to Computers) and ATCUS factor 4 (Comfort with Familiar Computer-Related Mechanisms) were the only individual significant factors in differentiating between high and low fidelity groups. ATCUS factor 4 (Comfort with Familiar Computer-Related Mechanisms) was the only significant factor that differentiated between moderate and high fidelity groups.

The results of an ANOVA indicated a statistically significant difference between faculty who reported adequate technological infrastructure and faculty who reported inadequate technological infrastructure. There was also a significant interaction between human infrastructure support and computer anxiety. Faculty with high computer anxiety improved on their technology integration skills when provided with adequate support from human infrastructure.

Conclusion

This research study investigated the complex relationships among these constructs: technological infrastructure, human infrastructure, attitudes toward computers, and technology integration fidelity with a random sample of higher education faculty representing SCDEs. This study contributes to the technology integration literature in the following ways: (1) provides evidence of tangible classroom practices in technology integration for teaching and learning in higher education, (2) offers a contemporary ICCM to measure technology integration among higher education faculty, (3) provides an updated description of faculty characteristics for SCDE faculty who integrate technology in their teaching, and (4) supports Roger's (1995) theoretical framework and the change literature associated with the Concerns-Based Adoption Model (CBAM) (Hall & Hord, 2001).

Note: The detailed instruments (ICCM, ATCUS and the Demographic Questionnaire) used in this study would be provided to the conference participants at the presentation.

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