Science Teachers Attitudes towards ICT

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Abstract

Teachers’ attitude is a major predictor in the process of ICT integration; this study investigated the ICT usage and the attitudes of high school science teachers in Karnataka towards ICT. This study focused on the relationship between computer attitudes and extension of ICT usage, computer attributes and personal characteristics. The data gathered through a questionnaire from in-service science teachers (N=84) working at government high schools were analyzed by using descriptive statistics. The findings suggest that the most widely used ICT tools are internet, software for repetitive practice, processing texts, interactive exercises and PowerPoint presentations. It was also found that science teachers hold positive attitudes towards the use of ICT for educational purposes: they regard computers as advantageous over traditional methods of instruction and suitable for their curriculum goals. However, the responses indicate that insufficient class time and inadequate training opportunities are the major obstacles in the process of ICT integration.

KEYWORDS: Science Teachers, ICT, Technology Integration.

Introduction

A large number of recent studies mostly conducted in controlled settings have revealed that the use of ICT for educational purposes yield positive outcomes on the part of the students such as increased motivation, active learning, providing efficient resources and better access to information (Young, 2003; Webb, 2005; Lau and Sim, 2008). These benefits have generated some attempts leading program developers to bring about educational reforms and initiate national programs to introduce ICT into education in countries worldwide, especially in developing countries. For this purpose, large amounts of money have been invested to the technical and infrastructure-related conditions necessary for ICT integration. Despite the increasing investments, research has shown that use of ICT for educational purposes is rather low. The related literature suggests teachers’ attitudes, knowledge and skill level as major obstacles for them to adopt and make effective use of ICT (Dexter, Anderson and Becker, 1999; Lang, 2000; Pelgrum, 2001). While a number of studies on teachers’ attitudes and ICT integration have been conducted in developed countries, there are few studies investigating this topic in developing countries, and even fewer focusing on attitudes towards ICT among teachers (Lau and Sim, 2008; Albirini, 2006). Therefore, the purpose of this study is to explore ICT usage by science teachers in Karnataka and their attitudes towards ICT for educational purposes.

Review of Related Literature

In Rogers (2003) theory of Diffusion of Innovations, which is one of the mostly referred theories in the studies related to ICT integration, and which provides a theoretical framework for the present study as well, puts a special emphasis on user’s attitudes towards a new technology. In this theory, the terms innovation and technology are used interchangeably, which proves to be suitable framework for the
study of diffusion of ICT in particular. According to this theory, a person goes through five stages while deciding on the adoption (or rejection) of the innovation: Knowledge, Persuasion, Decision, Implementation and Confirmation. These stages follow each other in a time ordered sequence, yet the first two stages are especially important as they immediately precede the decision stage. The knowledge stage covers the users understating of “what”, “how” and “why” of the innovation. Rogers (2003) notes that individuals’ level of “how-to” knowledge on the target technology is a crucial determinant for the technology adoption.

In the context of ICT integration, however, understanding teachers’ attitudes has not always been an easy task depending on the fact that various factors may be at work to affect one’s attitude. With regard to ICT integration, one of the major factors shaping people’s attitude is the attributes of the technology itself. Rogers (2003) has identified five main attributes of technology that contributes to its acceptance:

- Relative advantage (e.g. the target technology should have an advantage over previous innovations)
- Compatibility (e.g. it should be compatible with existing teaching practices)
- Observability (e.g. it should produce observable results)
- Complexity (e.g. it should be easy to understand and use)
- Trialibility (e.g. it should be tried out before adoption)

The relationship between teachers’ attitude, the factors affecting it and ICT integration has been examined in a number of studies (Leu and Sim, 2008; Tondeur, Hermans, 2008); however, most of them took an interdisciplinary approach in which teachers coming from different fields of expertise were investigated.

**Design of the Study**

This study also attempts to determine the relationship between teachers’ attitudes, computer attributes and perceived computer competence as they are thought to be influential on attitude towards ICT. An examination of demographic features of teachers in connection with ICT attitude is also included to have a detailed understanding on the topic. Specifically, the following questions have guided this study:

1. What is the extension of ICT use for educational purposes by science teachers?
2. What are the attitudes among science teachers towards the use of ICT for educational purposes?
3. What are the teachers’ perceptions regarding computer attributes
4. What are the relationships between certain variables such as gender, age, teaching experience, having home computer and the dependent variables stated above?

**a. Sample and Sampling Technique**

The respondents for this study were selected in accordance with convenience sampling procedure. The data gathering instrument were sent to 125 high school science teachers through e-mail, and 84 were completed and returned. All the teachers attending to the study were working at state government high schools. Table 1 summarizes the sample demographic features in accordance with gender, age, teaching experience and computer ownership.
Table: 1 Demographic features of the Sample

<table>
<thead>
<tr>
<th>Frequency (%)</th>
<th>Gender</th>
<th>Age</th>
<th>Teaching Experience</th>
<th>Own Computer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>20-29</td>
<td>30-39</td>
</tr>
<tr>
<td>61.9%</td>
<td>52</td>
<td>32</td>
<td>63</td>
<td>17</td>
</tr>
<tr>
<td>0%</td>
<td>75.0%</td>
<td>20.2%</td>
<td>3.0%</td>
<td>4.76%</td>
</tr>
<tr>
<td>Total</td>
<td>84</td>
<td>84</td>
<td>84</td>
<td>84</td>
</tr>
</tbody>
</table>

b. Data Gathering Tools and Technique

The survey method was followed to collect the data on ICT adoption of science teachers. The data collection tool was a questionnaire adopted from Albirini, 2009. It was a self-administered questionnaire consisting of 5 sections. The first section asks about the demographic features such as gender, age, teaching experience and own computer. Section 2 is designed to learn about the extent and frequency of ICT usage among participants. There are 14 statements in a five point Likert scale format in which 1 represents “never” and 5 represents “always”. The next section measuring teachers’ attitude contains 20 statements in five point scale from strongly disagree to strongly agree. The statements 1-6 measure the affective domain of attitude; items 7-15 are related to the cognitive domain and statements 15-20 are for the behavioural domain of the attitude. Section 4 includes 17 statements with regard to computer attributes. The first five items in this scale are about participants’ perceptions dealing with relative advantage of computers; items 6-10 asks about perceptions regarding computers’ compatibility with teachers current teaching practices; statements 11-14 ask whether the teachers perceive computers as complex or easy to understand and use; and items 15-17 measures perceptions about observability. Finally, section 5 of the questionnaire is designed to learn about teachers’ computer competence which was represented by a five point scale ranging from 1 (I cannot use it) to 5 (I can use it very well). Statements include ICT tools which are reported to be useful in education.

Data gathered through the questionnaire were analyzed by using MS Excel, Descriptive statistics (frequencies, means, percentage, standard deviation) were used in the analysis, and the results are presented in the following section.

Findings and Discussion

In order to have an idea about the extension of the usage of ICT tools by science teachers, the participants were asked to report on how frequently they use computer applications by responding to 14 statements in section 2. Accordingly, the most widely used ICT application among the science teachers is the tools used for classroom management M=4.2, SD=0.82, which is followed by the use of internet M=3.91, SD=1.22. Using software for repetitive practice M=3.54, SD=.82, processing texts M=3.45, SD=0.61, interactive exercises M=3.54, SD=1.10 and PowerPoint presentations M=3.42, SD=.94 are also among the frequently used ICT applications.

For the second research question, responses to a 20-item scale arranged in three parts measuring the affective, cognitive and behavioural domains of the attitude were analyzed and the results about distribution of mean scores are presented in table 2.
Table: 2 Distribution of mean scores on the attitude towards ICT scale

<table>
<thead>
<tr>
<th>Scale</th>
<th>Percentage</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affective Domain</td>
<td>7.7 4.4 10.4 44.3 33.3</td>
<td>3.92</td>
<td>0.98</td>
</tr>
<tr>
<td>Cognitive Domain</td>
<td>8.8 6.2 15.8 36.8 32.8</td>
<td>4.06</td>
<td>0.86</td>
</tr>
<tr>
<td>Behavioural Domain</td>
<td>0.0 1.72 10.30 39.42 48.56</td>
<td>4.34</td>
<td>0.64</td>
</tr>
<tr>
<td>Overall Attitude</td>
<td>8.27 4.10 12.16 40.17 37.30</td>
<td>4.10</td>
<td>0.82</td>
</tr>
</tbody>
</table>

Scale: SD=Strongly Disagree, D=Disagree, N=Neutral, A=Agree, SA=Strongly Agree

As table 2 shows, depending on the overall mean score of 4.10 (SD=0.82), it can be claimed that the participants have a positive attitude towards ICT. With regard to affective domain, it was found that 78% of the participants feel comfortable with ICT use in education, and they find using computers enjoyable. Only 12% of the teachers reported negative feelings about ICT as an educational tool. In the cognitive domain, about 70% (SD=0.86) of the science teachers believe that computers contribute to students’ learning and provide fast and easy access to information. 88% (SD=0.64) of the science teachers appreciate the advantages of teaching by means of computers and they believe that computers help to create effective teaching/learning environment, and are useful to save time and effort. The results for behavioural domain show that only a small portion of the attendants (15%) express doubts about effect of computers on students’ motivation or potentials of computers related with teaching practices.

The third research question is about teachers’ perceptions regarding the computer attributes identified in the literature as important factors shaping teachers’ attitudes towards ICT integration. Out of 17 statements, four groups of responses (namely responses about relative advantage, complexity, observability and compatibility) were identified depending on the focus of statements, and negative ones were reverse-coded before the analysis was carried out. The results are presented in table 3.

Table: 3 Distribution of mean scores on the computer attributes scale

<table>
<thead>
<tr>
<th>Scale</th>
<th>Percentage</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SD D N A SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative Advantage</td>
<td>1.3 5.2 12.1 39.1 42.3</td>
<td>4.12</td>
<td>0.52</td>
</tr>
<tr>
<td>Compatibility</td>
<td>14.8 14.3 9.14 45.1 16.7</td>
<td>3.42</td>
<td>0.85</td>
</tr>
<tr>
<td>Complexity</td>
<td>10.7 16.0 9.2 38.6 25.7</td>
<td>3.97</td>
<td>0.87</td>
</tr>
<tr>
<td>Observability</td>
<td>7.4 5.3 31.1 49.6 7.6</td>
<td>3.11</td>
<td>0.73</td>
</tr>
<tr>
<td>Overall attitude</td>
<td>8.55 10.2 22.9 43.1 15.5</td>
<td>3.65</td>
<td>0.74</td>
</tr>
</tbody>
</table>

As table 3 indicates, the highest mean in computer attribute scale was observed for relative advantage of computers (M=4.12, SD=0.52). Accordingly, the majority of the respondents believe that teaching with computers offers real advantages over traditional methods of instruction, and they have the potentials to improve the education. For negative statements, 89% of the participants expressed their disagreement with the statement about “computers are not useful for language
learning”; only 11% agreed with it. When asked about whether they perceive computers compatible with their teaching practices, 62% of the teachers responded positively (M=3.42, SD=0.85). 82% of the attendants expressed that computer use fits into their curriculum goal and 85% stated that computer use is appropriate for many language learning activities. However, they agreed that class time is insufficient for computer use. With regard to teachers perceptions about complexity of the computers, the mean score is calculated as 3.97 (SD=0.87) indicating that more than half of the teachers perceive computers as easy to use; however, they appreciate that learning about computers requires efforts to some extent since only 50% of them think that everyone can easily learn about computers. Finally, the mean score of the participants’ responses on observability is 3.11 (SD=0.73) representing the lowest among the other attributes. 60% of the respondents reported that other teachers in their school do not use computers, which should be taken into consideration while evaluating the ICT integration.

**Conclusion**

Taking a discipline based approach; this study investigated the ICT usage among science teachers and their attitudes towards ICT. It was found out that almost all the participants hold positive attitudes towards ICT though actual use of educational techs is not so widespread. The finding that most of the respondents are willing to learn more about ICT for educational purposes implies that this need of teachers should be considered while planning ICT integration policies and in-service training opportunities could make a sound base for the diffusion of ICT usage. Also the barriers reported by the teachers should be taken into consideration if the aim is to involve the teachers in the process of ICT integration. To have robust claims, however, further studies focusing on ICT usage, attitudes towards and barriers to ICT integration in the science context with a larger sample is required.

**References**


