Teachers’ Perceptions Related to Levels of ICT Implementation

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Abstract

The purpose of this study is to develop a scale to determine teachers’ perceptions related to levels of ICT implementation based on Levels of Technology Implementation (LoTi) framework. Data were collected from 327 teachers who work in 21 primary schools in Ankara. Confirmatory factor analysis was executed for validity of scale; reliability coefficient values and item total correlations were calculated for reliability of scale. As a result of confirmatory factor analysis, it was found that the scale consists of 34 items under 7 factors and explained 65.4% of the total variance. Reliability coefficient (α) of the scale is found .934.

Keywords: Levels of ICT implementation, ICT integration, teachers, scale development

1. Introduction

There is a growing interest in the usage of information and communication technologies (ICT) in learning-teaching process; especially the integration of ICT has been amongst the most discussed topics in recent years. Most of the researchers engaged in research about usage of ICT in education and its’ results and outcomes assert that ICT usage creates major changes in roles of teachers and students (Holden, Ozok, and Rada, 2008; Balanskat, Blamire, and Kefala, 2006). However, despite of supplying technology access, fostering teacher training, providing technical and pedagogical support, and stimulating the use of ICT, it is stated that the usage of ICT into learning-teaching process is still very low (Gill and Dalgarno, 2008; Martin and Vallance, 2008; Dawson, Forster, and Reid, 2006).

Sung and Lesgold (2007) expressed that there are three important problems about ICT usage in schools. First, although there isn’t adequate preparation for ICT usage in the administrative and educational contexts, there are high expectations from teachers. Second, even though there are ICT resources and applications in schools, teachers show little efforts to use of ICT in classrooms. Third, despite of developments in the field of ICT, there has been a little change regarding usage of ICT in teachers’ teaching methods. Also researches showed that teachers are unable to benefit from these advantages of ICT in the classrooms and reflect this in their professional lives, especially in instructional uses (Mumcu and Usluel, 2010; Holden, Ozok and Rada, 2008; Askar, Usluel, and Mumcu, 2006). Therefore, in order to explore integration of ICT into teaching-learning process, it is of particular importance to gain knowledge about teachers’ current level of ICT implementation.

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1.1. Levels of Technology Implementation (LoTi)

Hall and Hord (1987) developed “the concerns based adoption model” and defined usage of an innovation in eight levels according to this model. Moersch (1995) developed a framework dealing with measuring the real use of technology in classroom which is aligned conceptually with the work of Hall and Hord’s “levels of use”.

Level of technology implementation (LoTi) framework presents levels of technology integration development through seven levels: Awareness, Exploration, Infusion, Mechanical Integration, Routine Integration, Expansion, and Refinement. At Level 0 (No use), there is no indication of computer usage within classroom. At final level, Level 6 (Refinement), teachers use technology seamlessly within classroom for problem solving, product development, and to obtain information. The target level for teachers to reach technology integration is Level 4b or above for LoTi. As teachers progress from low levels of technology integration, which are teacher-centered, to higher levels of use, which are learner centered, a series of changes in the instructional curriculum is observed, so the instructional focus shifts from being teacher centered to being learner centered (Moses, 2006).

Accordingly, the purpose of this study is to develop a scale to determine teachers’ perceptions related to levels of ICT implementation in learning-teaching process based on LoTi framework.

2. Method

2.1. Participants

Data were collected from 327 teachers who work in 21 primary schools in Ankara. 78.5% of teachers were female (n=256), 21.5% were male (n=70); 47.2% of teachers were classroom teachers (n=154), and 52.8% were teaching in other subject areas (n=173). Participation in the study was voluntary, so it is expected that teachers responded to the scale honestly.

2.2. Scale development procedure

At the first stages of scale development, a draft scale is developed in a 10-point Likert-type; “1-Strongly Disagree” to “10-Strongly Agree”, consisting of 48 items. Experts were consulted for content validity, and the scale was finalized after rearranging expressions of some of the questions in accordance with feedback.

3. Findings

3.1. Confirmatory factor analysis

Confirmatory factor analysis was used on the data to confirm factors that are expected as a result of literature. The results obtained from the confirmatory factor analysis were examined for various fit indices which are mainly used in the examination of confirmatory factor analysis and structural equation models (Schermelleh-Engel et. al., 2003).

At the first confirmatory factor analysis on the draft scale, although some of the fit indices values such as $\chi^2/df$, CFI and NNFI were found within acceptable values, RMSEA value was found greater than 0.08, so a modification was needed. After modifications 14 items were excluded from scale because of low factor load values. Fit indices of the model are given in Table 1 as a result of second confirmatory factor analysis conducted on 34 items.
Table 1. Observed values of the scale as a result of first order confirmatory factor analysis

<table>
<thead>
<tr>
<th>Fit Indices</th>
<th>Perfect Fit*</th>
<th>Good Fit*</th>
<th>Observed Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMSEA</td>
<td>0&lt;RMSEA&lt;0.05</td>
<td>0.05&lt;RMSEA&lt;0.08</td>
<td>0.066</td>
</tr>
<tr>
<td>S-RMR</td>
<td>0&lt;S-RMR&lt;0.05</td>
<td>0.05&lt;S-RMR&lt;0.1</td>
<td>0.077</td>
</tr>
<tr>
<td>NFI</td>
<td>0.95&lt;NFI&lt;1</td>
<td>0.90&lt;NFI&lt;0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>NNFI</td>
<td>0.97&lt;NNFI&lt;1</td>
<td>0.95&lt;NNFI&lt;0.97</td>
<td>0.96</td>
</tr>
<tr>
<td>CFI</td>
<td>0.97&lt;CFI&lt;1</td>
<td>0.95&lt;CFI&lt;0.97</td>
<td>0.97</td>
</tr>
<tr>
<td>GFI</td>
<td>0.95&lt;GFI&lt;1</td>
<td>0.90&lt;GFI&lt;0.95</td>
<td>0.82</td>
</tr>
<tr>
<td>AGFI</td>
<td>0.90&lt;AGFI&lt;1</td>
<td>0.85&lt;AGFI&lt;0.90</td>
<td>0.78</td>
</tr>
</tbody>
</table>

χ²(chi-square) / df (1189.72/489)  χ²/df<3  3<χ²/df<5  2.43
*(Schermelleh-Engel, Moosbrugger, and Müller, 2003; Sümer, 2000)

The results of second confirmatory factor analysis showed that measurement model exhibited a good fit to the data (RMSEA=0.066; S-RMR=0.077; NFI=0.95; NNFI=0.96; CFI=0.97; GFI=0.82; AGFI=0.78; χ²/df=2.43). GFI and AGFI values are less than it is expected. But, given the sensitivity of GFI and AGFI, they have become less popular in recent years and it has been recommended that these indexes should not be used (Sharma et. al., 2005). As a result of the confirmatory factor analysis, it was found that rest of the 34 items consisted of 7 factors and explained 65.4% of the total variance.

3.2. Reliability analysis

Cronbach Alpha (α) reliability coefficient of the scale, which consists of 34 items, was calculated as .934. The reliability coefficients for each factor range from .681 to .886. In addition, item-total correlations for each item ranged from .339 to .812. Results of reliability analysis indicate that the scale has high reliability. As a conclusion, the levels of ICT implementation scale is a valid and reliable scale and it could be used to examine teachers’ perceptions related to implementation of ICT in learning-teaching.

Table 2. Results of reliability analysis

<table>
<thead>
<tr>
<th>Factor</th>
<th>Levels of ICT Implementation</th>
<th>Number of items</th>
<th>Reliability Coefficient (Cronbach α)</th>
<th>Sample item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Non-use of ICT</td>
<td>5</td>
<td>.681</td>
<td>I think it is unnecessary to spend time and effort to use ICT.</td>
</tr>
<tr>
<td>2</td>
<td>ICT usage for basic tasks</td>
<td>5</td>
<td>.761</td>
<td>I can use basic ICT applications (word processing, internet applications etc.) and multimedia preparation tools (PowerPoint etc.).</td>
</tr>
<tr>
<td>3</td>
<td>Beginning of ICT integration</td>
<td>5</td>
<td>.863</td>
<td>I plan how to use ICT while preparing instructional curriculum.</td>
</tr>
<tr>
<td>4</td>
<td>1. Level of ICT integration</td>
<td>6</td>
<td>.874</td>
<td>I lead my students to ICT resources and applications I think that would help their learning processes.</td>
</tr>
<tr>
<td>5</td>
<td>2. Level of ICT integration</td>
<td>4</td>
<td>.836</td>
<td>I can design products that are student-centered, integrated with instructional curriculum by using ICT.</td>
</tr>
<tr>
<td>6</td>
<td>3. Level of ICT integration</td>
<td>5</td>
<td>.828</td>
<td>I organize various conferences over Internet to participate teaching activities outside the classroom for my students.</td>
</tr>
<tr>
<td>7</td>
<td>4. Level of ICT integration</td>
<td>4</td>
<td>.886</td>
<td>My students use Internet to collaborate, publish, communicate, and to solve real-world problems.</td>
</tr>
</tbody>
</table>

The Scale 34  .934

4. Conclusions
The scale which was developed to determine teachers’ perceptions related to levels of ICT implementation in learning-teaching process based on LoTi framework included 34 items grouped under 7 factors as a result of confirmatory factor analysis. It was found that 7 factors explained 65.4% of the total variance. As a result of reliability analysis, Cronbach Alpha (α) reliability coefficient of the scale was calculated as .934 and it was found that the reliability coefficients for each factor ranged from .681 to .886.

The results obtained from the analysis showed that the scale is applicable to examine teachers’ perceptions related to implementation of ICT in learning-teaching. The integration of ICT into learning-teaching process has emerged in five levels from beginning to 4th level in the scale. It may be suggested that teachers’ integration of ICT into learning-teaching process can be defined in five levels:

• **Beginning of ICT integration**: Teacher organizes activities to develop students’ basic ICT skills, prepares lesson plans including ICT usage, and often takes advantage of available applications.

• **1. Level of ICT integration**: Teacher gives students homework which they could do research and analysis by using ICT to support their learning processes. Also teacher uses ICT to teach concepts, themes, and processes related to lesson.

• **2. Level of ICT integration**: The purpose of teachers’ ICT usage is to develop higher-order thinking skills of students. For this aim teacher uses ICT to design products that are student-centered, integrated with instructional program. Also teacher organizes activities to develop students’ problem solving and critical thinking skills.

• **3. Level of ICT integration**: Teacher and students communicate with other learners and experts via networks beyond the borders of classroom.

• **4. Level of ICT integration**: Students use ICT resources and applications to provide solutions to real-world problems related to content. Teacher’s teaching approach also supports it.

In this scale, seven factors were found. Five of seven factors indicate ICT integration process from beginning level to 4th level. It can be asserted that integration of ICT into learning-teaching process can be described in five levels in the scale. Consequently, the levels of ICT implementation scale, developed in this study, is expected to contribute to future studies related to integration of ICT into learning-teaching process.

**References**


