Knowledge and Application on Earthquakes:  
a Causal Research on Teacher Candidate Sample

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Abstract: This study aims to examine the degree to which teacher candidates’ cognitive readiness level on the concept of earthquake predict the application. Therefore, the research has been organized by using causal design. The universe of the research is composed of the teacher candidates who studied at the Department of Primary School Teaching under Kazım Karabekir Faculty of Education, Atatürk University during the 2009-2010 academic year. The sample of the research, which is composed of 367 teacher candidates who were in their 1st, 2nd, 3rd and 4th years, has been determined by applying the stratified sampling method- one of the methods used for random sampling. Data collection took place by using surveys oriented towards knowledge and application on the concept of earthquake arranged by the researcher. Frequency, Pearson Product Moment Correlation and Simple Linear Regression analyses have been utilized in analyzing the data. According to the results of the conducted correlation analysis, a positive significant relationship has been detected among teacher candidates’ knowledge and application attitudes regarding the concept of earthquake. Furthermore, it has been observed that the extent of knowledge regarding the concept of earthquake predicts 25% of the application.

Key words: Earthquake • Teacher candidate • Elementary education • Faculty of education

INTRODUCTION

The world is facing a number of human-related, technological, geological, meteorological and biological problems which are of particular concern to humanity. Among these problems are the natural disasters which affect large masses when they occur [1].

Disasters are natural, technological or human-related events which cause physical, economic and social losses for humans; which affect and are affected from human masses by preventing or interrupting human activities; and which cannot be overcome by humans using their own facilities and resources [2]. Despite the achieved level of knowledge and technology, humankind still has no effect on the occurrence of natural phenomena like earthquakes, droughts, volcanic eruptions and storms which can cause natural disasters. What humankind can do is very limited especially in terms of preventing these phenomena. Conducting researches, developing various plans and implementing these plans in order to avoid the effects of these disasters or minimize their effects on the society are the sole and the most efficient action which can be taken against disasters in our time and the future [3].

Natural disasters occurring in Turkey are studied in a wide range of headings. According to the available data, earthquakes constitute 65% of the disasters occurring in Turkey; landslides constitute 15%, floods 14% and other disasters like fires, avalanches and storms constitute about 10% of such disasters. The most interesting ones among these headings are earthquakes and floods in terms of their effects. 66% of Turkey’s area fall under seismic zone 1 and seismic zone 2 and 71% of the population live in these zones [4]. Turkey is located on the Mediterranean-Himalayan Seismic Belt which is among the large seismic belts in the world [5-8]. Earthquakes frequently occur along the fault lines and cause loss of life and property [9, 10].

Earthquakes are ground or crust movements the duration of which is defined in seconds. Earthquakes are caused by rupture of earth’s crust or by release of energy accumulated in magma through the weak spots of earth [5]. These tremors sometimes can be very minor while very intense at other times. Minor earthquakes can only be detected with special devices whereas intense...
earthquakes can destroy large structures and cities and more importantly, they can cause a death toll of thousands of people according to demographic characteristic of the earthquake region [11, 12, 13].

Many countries face and will continue facing the destructive examples of natural disasters like earthquakes [14]. Although people cannot prevent the occurrence of natural disasters, they can take a range of precautions for reducing the damage caused by these disasters [15]. Literature particularly emphasizes the importance of training on natural disasters in dealing with such natural disasters [16-22].

Hazards caused by earthquakes are inversely proportional to people’s level of awareness. If people know how to protect themselves against earthquakes and how to live with this phenomenon, hazards will decrease accordingly [23]. The importance of the problem regarding earthquakes is realized after such a disaster has occurred, yet it is forgotten after a while [6]. Apart from the force that causes earthquakes and physical features like the occurrence of the earthquake, human-related features of the earthquake, that is to say, the methods of protection against the earthquakes are the most discussed issue nowadays [24].

It is possible to prevent or at least minimize the damages caused by earthquakes. This can only be achieved by means of an efficient and continuous training on earthquakes. That training focused on earthquakes is a process which defines the earthquake and its formation mechanism starting from the structure of the earth’s crust and involves teaching the damage that can come out due to earthquakes and the methods of protection against such damage. Preparations before the earthquake and performance of rescue and first aid activities following the earthquake are among the issues which must be studied with diligence [25-27].

Schools are undoubtedly the places where earthquake education can be given in the most correct and the most reliable way. Schools, students and the personnel serving in schools are inevitable exposed to earthquakes [28]. Therefore, students must be told that it is possible to overcome the consequences of earthquakes with a very little damage in case the necessary measures are taken in schools [26, 29]. The most important responsibility on this issue belongs to the educational institutions and educators who teach knowledge and behavior in a systematic manner [24]. Many countries have already solved this problem by educating their children at an early age [30]. An individual, who has reached the level of elementary education joins a planned, programmed, intentional, directed, supported and compulsory educational process for the first time and constantly acquires new knowledge, skills and behaviors. With this aspect, elementary education constitutes a very significant and critical period in the development and education of the individuals [31]. Classroom teachers, who serve in the elementary education, are important links in raising the students. For that reason, this study aims to reveal the degree to which classroom teacher candidates, who will serve in the elementary education, can put into use their knowledge and the sources from which they gain knowledge on earthquakes.

**Research Design:** A causal research design has been applied in this research in order to examine the degree to which teacher candidates’ cognitive readiness level on the concept of earthquake predict the application. Causal research design is a research design which examines the cause and effect relationships that have emerged or are already existent among a number of variables. Causal research design is preferred when the correlation between the research variables is considered to have a cause and effect relationship [32]. Upon consideration that the relationship between knowledge and application in the theoretical structure is a cause and effect relation, knowledge level has been taken as the independent variable whereas application level has been taken as the dependent variable.

**Universe and Sample:** The universe of the research is composed of a total of 700 teacher candidates who were in their 1st, 2nd, 3rd and 4th years in the Department of Primary School Teaching under Kazım Karabekir Faculty of Education, Atatürk University during the 2009-2010 academic year. Stratified sampling method, which is among random sampling methods, has been used in order to determine the sample of the research. A total of 367 teacher candidates who were in their 1st, 2nd, 3rd and 4th years have been randomly selected from the related department and they constitute the sample group of the research. Information on the demographic features of the sample group is presented in Table 1.

**Process:** In the study, data have been collected by using surveys oriented towards knowledge and application on the concept of earthquake which have been prepared by the researcher. Cronbach’s Alpha value of the survey related to the level of knowledge on the concept of earthquake is 0.82 whereas the same value for the level of application on the concept of earthquake is 0.85. Research questions have been asked to the teacher candidates by the researcher himself. The extent of application has been determined as the dependent variable while the extent of
Table 1: Frequency and Percentage Distributions Regarding the Demographic Information on the Sample Group

<table>
<thead>
<tr>
<th>Options</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>159</td>
<td>208</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>367</td>
</tr>
<tr>
<td>%</td>
<td>43.3</td>
<td>56.7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>Academic Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>88</td>
<td>88</td>
<td>101</td>
<td>90</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>367</td>
</tr>
<tr>
<td>%</td>
<td>24.0</td>
<td>24.0</td>
<td>27.5</td>
<td>24.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>Interest in Geographical Subjects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>n</td>
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<td>128</td>
<td>172</td>
<td>55</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>367</td>
</tr>
<tr>
<td>%</td>
<td>3.3</td>
<td>34.9</td>
<td>46.9</td>
<td>15.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2: Results regarding the Sources That Contribute to Gaining Knowledge

<table>
<thead>
<tr>
<th>Priorities</th>
<th>Top Priority</th>
<th>Second Priority</th>
<th>Third Priority</th>
<th>Fourth Priority</th>
<th>Fifth Priority</th>
<th>Sixth Priority</th>
<th>Seventh Priority</th>
<th>Eighth Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sources</td>
<td>f</td>
<td>%</td>
<td>f</td>
<td>%</td>
<td>f</td>
<td>%</td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td>Science of Life</td>
<td>27</td>
<td>7.4</td>
<td>41</td>
<td>11.2</td>
<td>52</td>
<td>14.2</td>
<td>53</td>
<td>14.4</td>
</tr>
<tr>
<td>Social Sciences Lesson</td>
<td>20</td>
<td>5.4</td>
<td>55</td>
<td>15.0</td>
<td>59</td>
<td>16.1</td>
<td>54</td>
<td>14.7</td>
</tr>
<tr>
<td>Geography Lesson</td>
<td>124</td>
<td>35.8</td>
<td>41</td>
<td>11.2</td>
<td>50</td>
<td>13.6</td>
<td>32</td>
<td>8.7</td>
</tr>
<tr>
<td>Internet</td>
<td>41</td>
<td>11.2</td>
<td>51</td>
<td>13.9</td>
<td>34</td>
<td>9.3</td>
<td>54</td>
<td>14.7</td>
</tr>
<tr>
<td>Visual Media</td>
<td>88</td>
<td>24.0</td>
<td>80</td>
<td>21.8</td>
<td>47</td>
<td>12.8</td>
<td>50</td>
<td>13.6</td>
</tr>
<tr>
<td>Printed Media</td>
<td>7</td>
<td>1.9</td>
<td>49</td>
<td>13.4</td>
<td>71</td>
<td>19.3</td>
<td>48</td>
<td>13.1</td>
</tr>
<tr>
<td>Posters-Brochures</td>
<td>8</td>
<td>2.2</td>
<td>21</td>
<td>5.7</td>
<td>30</td>
<td>8.2</td>
<td>35</td>
<td>9.5</td>
</tr>
<tr>
<td>Family</td>
<td>29</td>
<td>7.9</td>
<td>22</td>
<td>6.0</td>
<td>60</td>
<td>16.2</td>
<td>41</td>
<td>11.2</td>
</tr>
</tbody>
</table>

Correlation Findings Regarding the Relationship between Teacher Candidates’ Knowledge and Application Scores on Earthquakes

Table 3: Relationship between Knowledge and Application Attitudes

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - The Extent of Knowledge</td>
<td>-</td>
<td>.499</td>
</tr>
<tr>
<td>2 - The Extent of Application</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

η=367, *p<.01

Simple Linear Regression Analysis Findings of Teacher Candidates’ Extent of Knowledge and Application on Earthquakes

Table 4: Simple Linear Regression Analysis Results between the Extents of Knowledge and Application

<table>
<thead>
<tr>
<th>Application Level</th>
<th>B</th>
<th>SE_B</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>11.230</td>
<td>1.475</td>
<td>7.629</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Knowledge Level</td>
<td>.464</td>
<td>.042</td>
<td>.499</td>
<td>11.015</td>
<td>.000</td>
</tr>
</tbody>
</table>

η=367, R=0.49, R²=0.28, F=121.329, p<.01

Knowledge has been determined as the independent variable for the regression model in analyzing the data. Frequency, Pearson Product Moment Correlation Coefficient and Simple Linear Regression Analysis have been utilized in analyzing the data.

Findings: Findings Regarding Teacher Candidates’ Opinions on the Sources That Contribute Them in Gaining Knowledge about Earthquakes.

Information regarding the resources, from which the teacher candidates gain knowledge about earthquakes, is given in Table 2.

When the table is examined, it is observed that among the sources of high percentages within the top priority from which the teacher candidates gain knowledge about earthquakes are Geography Lesson (35.8%), Visual Media (24.0%) and Internet (11.2%). Among the least priorities are Family (30.8%), Posters-Brochures (26.7%) and Science of Life (15.5%).

The results of the correlation analysis, which has been conducted to evaluate the relationship between teacher candidates’ knowledge and application on the concept of earthquake, are given in Table 3. As seen in the Table, it has been observed that there is a positive significant relationship in [r = .49] level between teacher candidates’ knowledge and application on the concept of earthquake.

Results of the simple linear regression analysis, which has been conducted to determine the power of teacher candidates’ extent of knowledge scores to predict their extent of application scores, are given in Table 4.

Durbin-Watson (D-W) test has been utilized to see whether or not there is autocorrelation in the model. D-W value has been found 1.902. Since the obtained value is not higher than 2, it can be stated that there is no autocorrelation between the variables. Tolerance values have been examined for multicollinearity problem and it has been observed that all tolerance values are higher

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than (1 - R2). Analysis has been continued after observing that there were no autocorrelation or multicollinearity problems.

When the Table has been examined, the power of the extent of knowledge to predict the extent of application has been found statistically significant $F(1, 365) = 121.329, p < .01$. In this regard, it is shown that the extent of knowledge on earthquakes explains 25% of the extent of application [$R = 0.49, R^2 = .25$]. In view of this finding, it has been found that a 75% change in the application score can be explained by other variables.

RESULTS AND DISCUSSION

Geography Lesson, Visual Media and Internet respectively constitute the top priority among the sources from which teacher candidates gain knowledge about earthquakes. Although the education given in the schools has an important role to inform people of the earthquakes, it has been observed that only geography lesson comes forward among the lessons given in schools. Each country is in need of a different geographical education. The location of a certain country on earth; its economic power; its geopolitical position; and other primary issues affect these differences [33]. Opportunities and challenges resulting from the structure of the land have always been important subjects for geographers [34]. Helping people understand the geographical properties of the area in which they live is one of the ultimate objectives of geography education [35]. The fact that geography lesson comes first among top priority in gaining knowledge about earthquakes shows that these subjects are taken into account when giving geography education in schools. Visual media, one of the prominent sources from which people gain knowledge today, takes the second place while the Internet takes the third. This result shows parallelism with the results of the researches which were conducted by [24] and [36]. However, in the research which was carried out by [37], it was observed that teachers take the first place; various sources take the second place; and media take the third place in terms of affecting this condition.

Family, Posters-Brochures and Science of Life respectively constitute the least priority among the sources from which teacher candidates gain knowledge about earthquakes. It is an interesting fact that family, which has quite an important significance for people to gain knowledge, takes the first place in the least priority. It is known that education starts in the family with the birth of the child and continues throughout the life with the education given in and out of school [38]. In this regard, [39] state that children must be included in the discussions and planning activities about earthquakes within the family. They emphasize that practices must be repeated roughly once in every six months in order for children not to forget the application to be performed and to form reflex against the hazard. The fact that family, which has a great importance in raising individuals, falls short in this matter shows the great importance of the responsibility of educational institutes. Earthquake disaster, which is a phenomenon that requires expertise, must be regarded as an issue that is serious and sensitive enough not to be left to families and must be handled by the educationists. This result shows parallelism with the result of the research which was conducted by Tsai (2001). Although posters-brochures catch people’s attention with their visibility, they have least importance among information sources. This result shows parallelism with those of the researches which were carried out by [24] and [36].

According to the results of the correlation analysis, which has been conducted to evaluate the relationship between knowledge and application attitudes towards the concept of earthquake, a positive significant relationship has been detected among teacher candidates’ knowledge and application attitudes towards the concept of earthquake. When the related literature is reviewed, it is observed that the researches on the knowledge level of earthquakes [1, 6, 15, 18, 20, 21, 22, 23, 26, 36, 37] and on the application level of earthquakes [16, 24, 27, 29] were examined in terms of various variables. However, there are no researches on the relationship between the knowledge and application about the concept of earthquake. It is considered important that researches focused on the relationship between the knowledge and application must become widespread among the researches to be conducted on earthquakes since such researches can earn education programmers and teachers a different point of view. Additionally; it is thought that relational and causal researches, which will raise individuals’ ability to put their knowledge into use, will make great contributions in raising individuals instead of the researches that only cover the cognitive levels of the individuals to get earthquake education.

The most important finding obtained in the research is the effect of the extent of knowledge about the concept of earthquake on the extent of application. The extent of knowledge regarding the concept of earthquake predicts 25% of the extent of application. This finding shows that
REFERENCES


