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Behavioral intention towards laboratory applications in science teaching

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Abstract

The aim of this study is to lay bare the behavioral intentions of pre-service science teachers towards laboratory applications as well as to bring into light what factors shape these intentions. To this end, a questionnaire, developed by the researchers based on the Theory of Planned Behavior (TPB, Ajzen, 1985) was used. The questionnaire consists of an introduction in which there are questions about personal information, and Scales of Attitude, Personal Norm, Perceived Behavior Control related to Behavior, which is one of the components of TPB. 157 pre-service teachers who are students at the departments of chemistry teaching, biology teaching, and science teaching participated in this research. In the evaluation of the data, a Structural Equality Model was formed by using the AMOS program. According to the results of the model, in the behavioral intentions of the pre-service teachers during laboratory applications, their attitudes, their perceived behavior controls, and their personal norm were influential, respectively. The developed model explained the behavioral intentions of the pre-service teachers toward laboratory applications at the rate of 78%.

Keywords: laboratory applications, Theory of Planned Behavior, structural equality model.

1. Introduction

Today, laboratory applications have been accepted as one of the most effective methods in science teaching. Laboratory applications help students learn in an easier and a more permanent way by enabling them to make observations, examinations and experiments. Because of this, laboratory applications are an indispensible part of science teaching. Beginning with the mid 19th century, laboratory method has been accepted as a fundamental part of science teaching and it is seen that its importance has increased over the years (Wheatley, 1975; Çepni et al., 1995). Today, a majority of science teachers are in agreement of the importance and necessity of laboratories in science classes (Yıldız, 2004). Laboratory studies affect critical thinking, reasoning, understanding science, and they facilitate students with the tools of learning to generate knowledge (Çepni et al, 1995). For this reason, Zuzuvosky (1999) emphasized the importance of the applied dimension of science teaching which depends on experimenting in laboratories, both in terms of epistemology and education. Many classes offered in science education can be meaningful only when they are offered in applied form or when their application is done. That is why the use of laboratories in order for an applied education in science education is highly important. When the fact that laboratory applications in our country have not been done properly, effectively or sufficiently is taken into consideration

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(Erten, 1993; Ayas et al, 1994; Ekici, 2002; 2003), the proper and to-the-point laboratory application in science education is possible only with qualified teachers who are trained in this field. In order to provide a solution to this existing problem, the education of the pre-service teachers, who will be educating future generations, gains great importance. In this respect, bearing in mind that this importance should be especially emphasized in classes that are offered in faculties of education and classes that require laboratory applications, this study has been done in order to put forth the opinions of pre-service biology, physics and chemistry teachers on laboratory applications. As such, it is thought that the laboratory application behaviors of pre-service teachers could be predicted and that in the process of teacher training necessary precautions and regulations in this field could be developed.

2. Method

2.1. *Research Sample*

The research sample consisted of a total of 157 pre-service students who have been studying at Ankara Hacettepe University in 2010-2011, 38 of these are male (25%) and 119 of them are female (75%). 6 of these pre-service teachers (39%) are students at the department of biology education, 42 of them (27%) are from the department elementary science education, 24 of them (15%) are from the department of physics education, and 30 of them (19%) are from the department of chemistry education.

2.2. Data gathering tools

The questionnaire (Kılıç and Soran, 2011), which was developed based on the Theory of Planned Behavior (Ajzen, 2002) consists of *Scales of Attitude towards Behavior, Subjective Norm and Perceived Behavior Control,* each of which are likert type of seven. For the positive items in the scales, the options "I do not agree at all" – "I completely agree" were graded from 1 to 7, and they were graded from 7 to 1 for negative items. The questionnaire form consists of an introduction section which includes personal information such as age and gender, and a total of 64 items. The Theory of Planned Behavior is Expectancy-Value Theory (Frey et al, 1993) at the same time, in other words, first of all the perception of the existing expectations and then the importance of these expectations for the subject are questioned for each dimension. Taking this into consideration, before moving on with the analyses, the real values to be used in the study were determined by multiplying the numbers referring to the answers given to the items in the beliefs section. For example, students' opinions on the result of the behavior were determined with the item "*if I make laboratory applications, the interest of students towards class would increase"* in the behavioral beliefs dimension, and the importance of the results was determined with the question "*how important is the increase of students' interest in class for you?*" In the analysis section, the answers given to these items were multiplied and the resulting value was treated as a single item.

2.3. Data Analysis

The reliability of the scales was calculated by the Cronbach-alpha internal consistency coefficient.

Structural Equality Model (SEM) was developed in line with the Theory of Planned Behavior. AMOS18 Program was used in the SEM analysis. In the tests for the appropriates of the model, Schermelleh- Engel et al (2003) determined that X^2/df smaller than 3, RMSEA smaller than .10, and GFI and CFI bigger than .90 are the criteria for acceptable consistency.

In the evaluation of the regression coefficients of the structural equality model, the criteria suggested by Ajzen and Fishbein (1980) were taken into consideration. 0.0-0.3 was assessed as weak, 0.3-0.5 as mediocre, and 0.5 and above was assessed as high regression coefficients.

3. Findings

The Cronbach-alpha values of the scales for attitude, subjective norm and perceived behavior control were calculated as .79, .92, and .77, respectively. These values show that the scales have given reliable results in the group that it was applied to (Büyüköztürk, 2006).

The appropriateness of the data to the TPB and the structural equality model that was constructed for the "explanation of the intention" case was given in Figure 1.

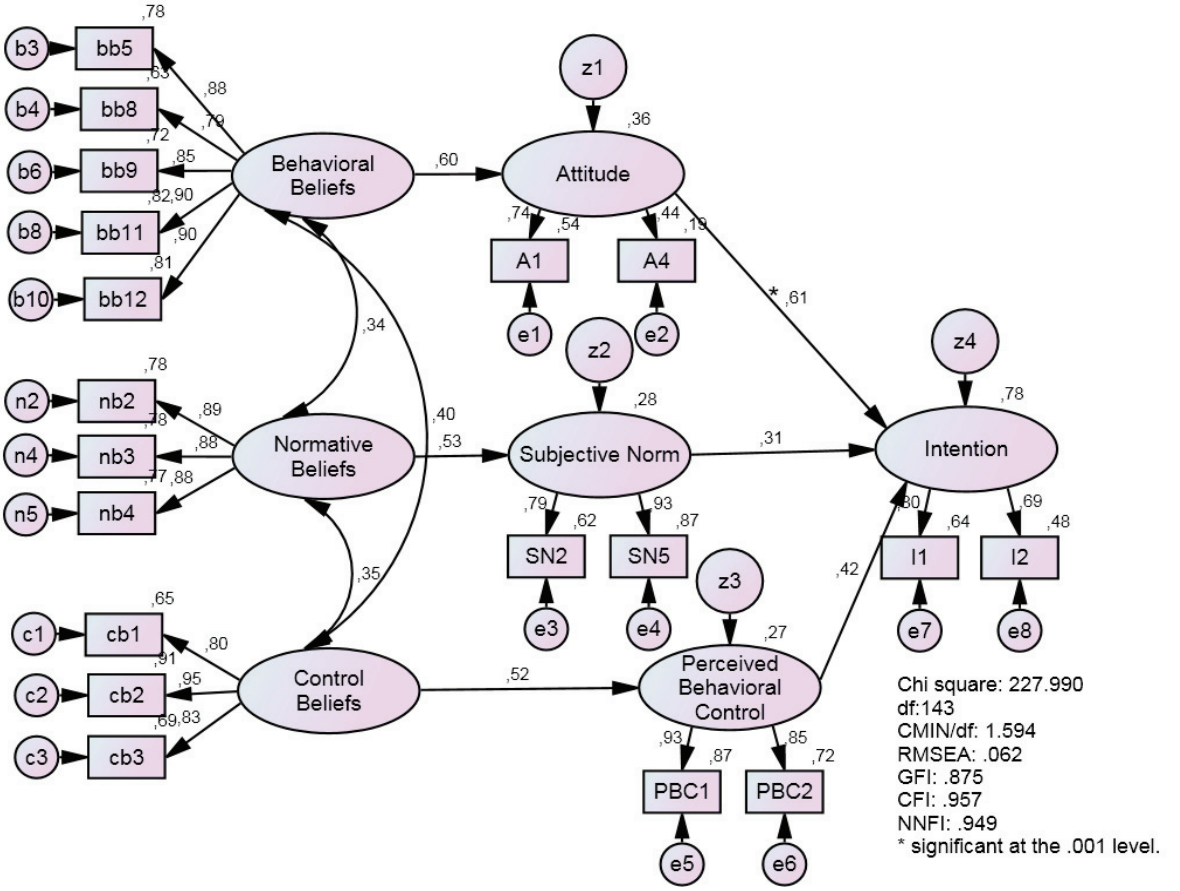

Figure 1: Structural Equality Model for the Laboratory Application Intentions of Pre-service Teachers (Standardized Solution Values)

As can be seen in Figure 1, the compatibility statistics of the model is within the determined bracket for compatibility criteria.

The regression equation obtained after the analysis is as follows:

Behavioral Intention = (A x .61) + (SN x .31) + (PBC x .42)

Depending on the coefficients in this regression equation, it can be said that pre-service teachers' intentions of making laboratory applications are under the influence of their Attitude (.612= %37), Perceived Behavior Controls (.422= %18), and Subjective Norms (.312= %10), respectively. When these ratio were assessed taking into consideration the regression coefficients determined by Ajzen and Fishbein (1980), it can be said that the attitudes of pre-service teachers has a high influence on their laboratory application intention, and that their perceived behavior controls and subjective norms have a mediocre influence on their laboratory application intentions. The variant percentage of the dependent variable of behavioral intention which is explained by the independent variable of attitude and perceived behavior control is .78, in other words, the Theory of Planned Behavior explains the laboratory application intentions of pre-service teachers in 78%. The explained variant percentages of the subjective norm and perceived behavior control dimensions are 36% (.602), 28% (.532), and 27% (.522), respectively. There is

an intermediate and positive meaningful relationship among these dimensions (r1=.34, r2=.40, r3=.35, p<.01) (Büyüköztürk, 2006).

Pre-service teachers' behavioral intention towards laboratory applications were calculated directly through 2 items (I1: When I became a teacher, I'll carry out laboratory applications (.80); I2: When I became a teacher, I'm planning to carry out laboratory applications (.69)).

Pre-service teachers' attitude towards laboratory applications were calculated directly through 2 items (A1: Laboratory applications are enjoyable for me, A4: Laboratory applications are waste of time for me). In the behavioral beliefs section, pre-service teachers stated that the following results will take place if they make laboratory applications and that these results are important for them:

bb5= Students would comprehend the subject better x this gain of theirs is important for me (.88).
bb8= Students enjoy the class x this gain of theirs is important for me (.79)
bb9= An effective learning takes place x this acquisition of theirs is important for me (.85)
bb11= A permanent learning is obtained x this acquisition of theirs is important for me (.90)
bb12= Students can learn a subject easily x this acquisition of theirs is important for me (.90)

In the model, pre-service teachers' subjective norms towards laboratory applications were calculated directly through 2 items (SN2: Many people who are important to me expect me to make laboratory applications. SN2: People I value care about the idea that I make laboratory applications). In the normative beliefs section, the people or institutions that pre-service teachers think would have the influence on them to make laboratory applications are as follows:

nb2: The principle expects me to make laboratory applications x the expectation of the principle is important for me (.89)
nb3: Head of the department expects me to make laboratory applications x the expectation of the head of department is important for me (.88)
nb4: Inspectors expects me to make laboratory applications x the expectation of the inspector is important for me (.88)

Pre-service teachers' perceived behavior controls towards laboratory applications were calculated directly through 2 items (PBC1: if I want to make laboratory applications, I would do it no matter what. PBC2: If I want to, I can easily make laboratory applications). The conditions which are influential in pre-service teachers' making laboratory applications are as follows:

cb1: There will be a laboratory where I can make laboratory applications in the school I will work at x This would make my making laboratory applications easier (.95)
cb2= I can get the necessary materials for the laboratory applications x This would make my making laboratory applications easier (.95)
cb3= I will have enough time for laboratory applications x This would make my making laboratory applications easier (.83)

4. Result and Discussion

When the fact that pre-service teachers' laboratory application intentions are, for the most part, under the influence of their attitude is taken into consideration, it is clearly seen that emphasizing the importance and necessity of laboratory applications in teacher trainings is very important. As long as pre-service teachers are convinced that laboratory applications are beneficial for students (it enables a permanent, easy and effective learning, it makes classes more enjoyable for students), they will be highly likely to include laboratory applications in their curriculum. The effect of perceived behavior control over intention of making laboratory applications is also rather high. According to the findings, having a laboratory at school, having necessary material and enough class hours affects pre-service teachers' making laboratory applications. This case, although positive, indicates that unless required conditions are met, laboratory applications intention would be at a low level. Therefore, it is thought that improving

these conditions at schools would also increase the occurrence of laboratory applications. Laboratory conditions at schools should be improved, and timeslot spared to laboratory applications should be increased. Furthermore, it is seen that pre-service teachers are affected by the expectations of their colleagues. The principle's, department head's and inspectors' attitude towards laboratory applications and their expectations are influential factors in the pre-service teachers' laboratory applications decisions. The increase in the expectation from the teachers to make laboratory applications necessitates that these people are convinced of the necessity of such applications. Because the participants of this questionnaire are from different departments, which require different curriculum and methodologies and different student levels, it is thought that their viewpoint of laboratory applications will be different. Therefore, examining the difference between departments by using big samples would help a more specific analysis of the situation.

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