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Determination of relationship between prospective chemistry teachers' scientific epistemological views, information commitments and online searching achievement

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Abstract

The aim of this study is to examine the relationship between scientific epistemological views (SEV), information commitments (IC) and online searching achievement of prospective chemistry teachers. In order to measure prospective chemistry teachers' epistemological views about science, SEV Questionnaire originally developed by Tsai and Liu (2005) and adapted by Lin and Tsai (2008) were used. And in order to examine prospective chemistry teachers' evaluative standards and searching strategies of online science information, Information Commitments Survey (ICS) developed by Wu and Tsai (2005) were used. The relationship between scientific epistemological views, information commitments and online searching achievement of prospective chemistry teachers was examined.

Keywords: Scientific epistemological views, information commitments, online searching achievement, prospective chemistry teachers.

1. Introduction

The internet technology has an important place in the field of education as it is used in a lot of areas. The internet is a perfect device via which students can enrich their learning habits and experiences (http://www.tftml.k12.tr/devran/rasim_umit/egitimde_internet.htm). The studies carried out with teachers and students indicates that using the internet with the purpose of education increases students interests, changes teacher-student relationship, contributes to shaping opinions and analysis of thoughts (Pichault, 2001, Choi and Hannafin, 1995). Students generally use the internet in order to make research about a determined subject and choose the presented data, prepare documents, share, make discussions about the data given in relation to the subjects they searched, do exercises, communicate with other students and share information (Küçükcankurtaran, 2008). However, that kind of research activities brings about the risk of students' coming across incorrect and unreliable data which are not well structured. Students need some criteria in order to evaluate the data in different sources and the success they obtained during making research is related with the evaluation criteria applied by them and their choices (Hoffman et.al.2003). Information commitments (ICS) include a set of standards students possess toward online information and the searching strategies they utilize for examining the merits of Web-based materials. Many studies carried out indicated that successful learning is related with students' features such as cognitive style,

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preferences, learning style, information processing strategy and epistemological beliefs (Yang and Tsai, 2008). As it was stated by Bendixen and Hartley (2003) and Braten and Stromso (2006), epistemological beliefs play an important role in determining performance and strategic preferences in internet-based activities. Epistemology defines the beliefs of people about the nature of information and the process of structuring knowledge (Hofer, 2000, 2001; Hofer and Pintrich, 1997). The concept of Scientific Epistemological Views reflects the views of people about the nature of knowledge as well as explaining their awareness towards science (Abd-el-Khalick, Bell and Lederman, 1998; Tsai and Liu, 2005; Lin and Tsai, 2008).

1.1. Aim of the study

The aim of this study is;

1. to determine the levels of Scientific Epistemological Views of prospective chemistry teachers',
2. to determine prospective chemistry teachers' Information Commitments toward science information on the web,
3. to determine prospective chemistry teachers' achievement of making online research on the subject of renewable energy,
4. to examine the relationship between scientific epistemological views (SEV), information commitments (IC) and online searching achievement of prospective chemistry teachers.

1.2. Research Problems

1. What is the level of prospective chemistry teachers' Scientific Epistemological Views?
2. How is prospective chemistry teachers'' Information Commitments toward science information on the web?
3. What is the level of success of prospective chemistry teachers' making online research on the subject of renewable energy?
4. Is there a relationship between prospective chemistry teachers' scientific epistemological views (SEV), information commitments (IC) and online searching achievement?

2. Method

2.1. Sample

The sample of the study consists of 34 prospective chemistry teachers attending Basic Chemistry I course at Department of Chemistry Education at Faculty of Education, Hacettepe University.

2.1. Data collection tools

The Scientific Epistemological Views Questionnaire: In order to measure prospective chemistry teachers' epistemological views about science, SEV Questionnaire originally developed by Tsai and Liu (2005) and adapted by Lin and Tsai (2008) was used. SEV questionnaire is a six point Likert Scale from 1 (strongly disagree) to 6 (strongly agree) and consisted of 19 items. Maximum score that can be obtained from the questionnaire is 114. The internal reliability was determined as 0, 67 by Tsai and Liu (2005). SEV questionnaire is translated and adapted into Turkish and reliability was found as 0, 86.

Information Commitments Survey: In order to examine prospective chemistry teachers' evaluative standards and searching strategies of online science information, Information Commitments Survey (ICS) developed by Wu and Tsai (2005) was used. The items of the ICS were presented in a six point Likert Scale and consisted of 24 items and 6 subscales.

Table 1. SEV questionnaire and sample items

	Scale Definition	The sample item
Multiple sources as correctness (MS scale)	To measure whether students evaluate the correctness of Web based science information by referring to other web sites, peers, or printed texts.	When I view some science information on the Web with which I am unfamiliar, I will try to find more web sites to validate whether the information is correct.
Authority as correctness (AU scale)	To assess whether students examine the correctness of Web based science information by the reputation of the web sites or sources.	When I view some science information on the Web with which I am unfamiliar, I will believe in its accuracy if the information is posted on professional (official) web sites.
Content as usefulness (CO scale)	To explore whether students judge the usefulness of Web-based science information by the relevancy of its content.	When I view or navigate science information on the Web, if it can help me search relevant information further, I will consider the information useful to me.
Technical as usefulness (TE scale)	To assess whether students evaluate the usefulness of Web based science information by the ease of retrieving, searching, and obtaining information.	When I view or navigate science information on the Web, if it does not require a password or registration, I will consider the information useful to me.
Elaboration and exploration as searching strategy (EL scale)	To measure whether students have purposeful thinking or integrate Web-based science information to fulfill their purposes.	When I search for science information on the Web, I can use some acquired information for an advanced search to find the most-fit information.
Match as searching strategy (MA scale)	To investigate whether students use only a set of keywords to find a few web sites that contain the most fruitful and relevant science information	When I search for science information on the Web, I am eager to find a single Web site that contains the most fruitful information

(Wu and Tsai, 2005)

The reliability (alpha) coefficient of each scale, reported by Wu and Tsai (2005), was .72, .82, .88, .76, .84, and .74, and the overall alpha was 0.80.

SEV questionnaire is translated and adapted into Turkish and reliability was found as .63, .77, .87, .82, .85, .70 and overall alpha was 0.86.

The Reports Prepared by Prospective Chemistry Teachers on Renewable Energy Resources: In order to determine the success of students in making online research, the subject of "Alternative Energy Sources" was given to them and they were wanted to prepare reports by making research in the internet environment. The reports of students were evaluated upon 30 points by taking the criteria "content knowledge", "keywords", "usage of different web sites", "visual tools", "using references" and "presenting knowledge" into consideration. 5 points were given for each criterion.

2.2 The implementation steps of the study

In the beginning of the study, the subject of "Alternative Energy Sources" was given to prospective chemistry teachers and they were requested to prepare homework by making research from the sources related to the subject in the internet environment. The reason why "Alternative Energy Sources" was chosen as the subject is that subjects such as the use of alternative energy sources and energy saving are on the agenda in our day and all prospective chemistry teachers are the people who will educate the society about this subjects as the people having required knowledge and awareness. At the same time, SEV Questionnaire and ICS were given to prospective chemistry teachers and they were wanted to fill the questionnaires.

3. Findings

The resulting findings were examined in line with the research questions of the study. With regard to the first and second research question of the study, the levels of prospective chemistry teachers' Scientific Epistemological Views and Information Commitments toward science information on the web were analyzed. The results of descriptive statistics were given in Table 2.

Table 2. Descriptive statistics results of SEV questionnaire and IC Survey

	N	Minimum	Maximum	Mean	Std. Deviation
SEV Questionnaire	34	23,00	113,00	88,67	18,48
IC Survey.MS Scale	34	14,00	24,00	18,23	2,60
IC Survey AU Scale	34	12,00	28,00	21,76	4,36
IC Survey CO Scale	34	5,00	30,00	23,00	5,06
IC Survey TE Scale	34	9,00	28,00	20,08	5,25
IC Survey EL Scale	34	5,00	30,00	23,20	4,97
IC Survey MA Scale	34	13,00	30,00	20,55	4,29

As seen in Table 2 mean score of SEV Questionnaire is = 88, 67 This finding shows that students' scientific epistemological views are at high level. When subscales of IC Questionnaire are investigated, it is observed that prospective teachers have higher points nearly at all subscales. The highest points are at EL Scale =23, 20; CO Scale = 23, 00 and the lowest points are at MS Scale =18, 23.

To analyze the third research question of the study to determine prospective teachers' achievement of making online research on the subject of renewable energy, descriptive statistics were applied. Table 3 shows the results of descriptive statistics.

Table 3. Descriptive statistics results of prospective teachers' online research achievement

	N	Minimum	Maximum	Mean	Std. Deviation
Online research achievement	34	2	24	10	5,98

When Table 3 is investigated, it is observed that the mean scores obtained from the reports prepared by prospective teachers on renewable energy resources making research in the internet environment is =10.

To mention the fourth research question of the study; a simple correlations analysis was carried out in order to investigate the relation between the prospective chemistry teachers' SEVs, ICs and success level at making online research about the subject "Alternative Energy Sources" and Pearson correlation coefficient was estimated.

There has been a significant, positive relation between prospective chemistry teachers' SEVs, ICs ($p<0, 01$, $r=0, 56$) but there is not any relationship between success at making online research and SEVs and ICs.

4. Results and conclusion

In line with the first research question of the study, prospective chemistry teachers' SEV and IC levels were examined. Consistent with Schommer's (1993) findings, it was found that prospective chemistry teachers' SEVs are at high level.

When IC scores are investigated according to subscales, the highest points are at EL Scale, CO Scale. This means that during online searching, prospective chemistry teachers have purposeful thinking or they integrate web-based science information to fulfill their purposes and they judge the usefulness of web based science information by the relevancy of its content. The lowest points are at MS Scale, this shows that prospective chemistry teachers do not pay attention to evaluate the correctness of web-based science information by referring to other web-sites, peers or printed texts.

To mention the second research question, prospective chemistry teachers' achievement of making online research on the subject of renewable energy was determined. Prospective chemistry teachers' achievement level was found very low. Although they have the ability to search on internet and find relevant sites, they were unsuccessful by preparing a report and summarizing the relevant information. The reason of this result may be prospective chemistry teachers' being freshman or being not used to prepare such reports.

Within the third research question, it was determined that there has been a significant, positive relation between prospective chemistry teachers' SEVs. These findings are consistent with the findings of Tsai (2004), he states that "the epistemological views students possess toward scientific knowledge may guide or shape the standards they hold for assessing information and knowledge resources related to science on the web". But there is not any relationship between success at making online research and SEVs and ICs. However some studies like Cavallo, Rozman, Blickenstaff and Walker (2003), Zeidler, Walker, Ackett and Simmon (2002) suggest that students' SEVs may be related to their achievement, the findings of this study is inconsistent with those suggestions.

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