Examining learning approaches of science student teachers according to the class level and gender

TURAL DİNÇER Güner, AKDENİZ Ali Rıza

(Department of Secondary Science and Math Education, Fatih Faculty of Education, Karadeniz Technical University, Trabzon 61335, Turkey)

Abstract: There are many factors influence the level of students' achievement in education. Studies show that one of these factors is "learning approach of a student". Research findings generally have identified two approaches of learning: deep and surface. When a student uses the deep approach, he/she has an intrinsic interest in subject matter and is interested in ideas and conclusions to understand the subject matter. When a student employs the surface approach, he/she merely memorizes knowledge to pass any exam in school. The aim of this study is to determine learning approaches of science student teachers and to examine the relationships among the variables, such as level of students' class and gender. The sample of this study consists of 108 student teachers from the Science Education Program at Department of Primary Science Education in Karadeniz Technical University. Approaches to learning of science student teachers are assessed using the Revised Two-factor Study Process Questionnaire (R-SPQ-2F), a scale developed by Biggs, et al (2001) consisting of 20 items on a 5 point Likert Scale. According to findings, science student teachers generally have deep learning approaches. Moreover, learning approaches of science student teachers have not changed related to gender.

Key words: deep and surface learning approaches; science student teacher; level of class; gender

1. Introduction

The studies by Marton and Saljö (1976a, 1976b) on how students perceived a particular reading task and then went about learning it, introduced the idea of "approach to learning". Students' approaches to learning describe whether they engage in learning environment with learning matters (Spencer, 2003). The educational area describes two fundamental approaches to learning: deep and surface. The deep approach is characterized by student's interest in learning and his/her connection with previous or new ideas, events and conclusions. Deep learners try to understand the real meaning of concepts. The surface approach is characterized by student's lack of interest in the subject matter and memorization of exam knowledge. That approach regard learning as an external state (Spencer, 2003; Byrne, et al., 2001).

Deep approach is described as:

(1) Asking actively in during learning process;

(2) Trying to understand learning materials;

TURAL DİNÇER Güner, assistant researcher, Department of Secondary Science and Math Education, Fatih Faculty of Education, Karadeniz Technical University; research fields: physics education, material development.

AKDENİZ Ali Rıza, Ph.D., professor, Department of Secondary Science and Math Education, Fatih Faculty of Education, Karadeniz Technical University; research fields: physics education, material development, teacher education, development of program.

(3) Linking knowledge with life experiences;

(4) Learning for learning;

(5) Not being pleased with knowledge just learned in class;

(6) Looking for knowledge from different sources;

(7) Joining to lessons actively.

Surface approach is described as:

(1) Accepting given knowledge declared by teacher without thinking about;

(2) Copying knowledge;

(3) Just aiming to pass a class rather than learn;

(4) Accepting teacher as a single and trusty knowledge source;

(5) Being passive in classes (Selçuk(Sezgin), et al., 2007).

The educators suggest that surface approach is associated with a less successful academic performance and deep approach is with higher academic performance (Byrne, et al., 2001; Davidson, 2002; Booth, et al., 1999; Gow, et al., 1994; Biggs, 1993; Eley, 1992).

Siddiqui (2006) investigated study approaches of Pakistani students in tertiary institutions using the Revised Two-factor Study Process Questionnaire (R-SPQ-2F). The sample comprises 13331 students who appeared countrywide at 15 centres for National Postgraduate Scholarship examination in December 2003. The results showed that the students predominantly have higher scores on deep approach. No statistically significant differences were observed on the basis of gender, age and highest qualifications obtained but differ significantly for various fields of study. There are many studies related to learning approaches of students in abroad like that (Elias, 2005; Dickie, 2003; Duff, 2002; Davidson, 2002; Bryne, et al., 2001; Pimparyon, et al., 2000; Booth, et al., 1999; Nguyen, 1998; Prosser, et al., 1996; Gow, et al., 1994; Eley, 1992; Trigwell & Prosser, 1991a; Trigwell & Prosser, 1991b). However, there is not enough study (Selçuk (Sezgin), et al., 2007; Berberoğlu & Hei, 2003; Ellez & Sezgin, 2002) on that field in Turkey.

It is a real that qualified learning is influenced by student's learning approach (Byrne, et al., 1999). For these reasons, this study aimed to determine the learning approaches of science student teachers from Karadeniz Technical University and to examine the relationships among the variables of students' class levels and gender.

The main question for this study is which learning approaches science student teachers have.

Sub-questions are:

(1) Is there a significant difference between students' class level regarding to the learning approaches of science student teachers.

(2) Is there a significant difference between students' gender regarding to the learning approaches of science student teachers.

2. Methodology

In the study, survey method was used. The sample of this study consists of 108 student teachers from the Science Education Program at Department of Primary Science Education in Karadeniz Technical University. The class level and the number of the student teachers joined the study are given in Table 1.

Table 1 The number and level of the students

Class level	N
I	28
II	19
III	29
IV	32
Total	108

It is known that conducting interviews with nearly all of the students is difficult if the sample is large to determine learning approaches of students. Moreover, it can not be sufficient to conclude. Richardson (1994) suggests that using standard questionnaires is more reliable than using qualitative methods to determine learning approaches of students.

The Revised Two-factor Study Process Questionnaire (R-SPQ-2F) which is a scale developed by Biggs, et al (2001) and consists of 20 items on a 5 point Likert Scale, was used to determine the science student teachers' approaches to learning. The Revised Two-factor Study Process Questionnaire (R-SPQ-2F) is developed from the original SPQ (Study Process Questionnaire) by Biggs, et al (2001) to ensure suitable for use by teachers to evaluate their own teaching and the learning approaches of their students. The 43 items taken from the original SPQ and from the SPQ in modified form or new items are tested. The process of testing and refinement resulted in a final version with deep and surface approach scales. Each of these scales consists of 10 items.

The responses to items are scored as follows:

A (this item is never or only rarely true of me) =1

B (this item is sometimes true of me) =2

C (this item is true of me about half the time) =3

D (this item is frequently true of me) =4

E (this item is always or almost always true of me) =5

To obtain the two approaches' scale score, the item scores are added as follows:

DA (Deep Approach) = 1+2+5+6+9+10+13+14+17+18

SA (Surface Approach) = 3+4+7+8+11+12+15+16+19+20

The data was analyzed using SPSS version 15.0 for Windows. For reliability the Cronbach Alpha value of scale for deep approach subscale is calculated 0.73, for surface approach subscale is calculated 0.69.

3. Findings

This part contains mean scores and standard deviations to determine the learning approaches of the science student teachers according to the class level and gender. t test was performed to determine whether there are statistically significant differences on any of the subscales on the basis of gender and class level. The results of data analysis are given in Table 2, Table 3 and Table 4.

Table 2 The arithmetical means and standard deviations of scale scores of science student teachers

Approaches	N	Mean	Standard Deviation
Deep approach	108	2.86	0.56
Surface approach	108	2.72	0.60

According to Table 2, science student teacher's deep approach mean score (M=2.86) is higher than surface approach mean score (M=2.72).

Table 3 The arithmetical means, standard deviations of scale scores of science student teachers according the class level

Approaches	Class level	N	Mean	Standard deviation
Deep approach	I II III IV	28 19 29 32	3.06 2.87 2.73 2.78	0.51 0.47 0.57 0.62
Surface approach	I II III IV	28 19 29 32	2.46 2.76 2.86 2.78	0.64 0.56 0.58 0.56

According to Table 3, first year student teachers had the highest mean score on the deep learning approach. In the second and third years student teachers' deep approach scores decreases. The mean score begins to increase in the fourth year.

On surface approach, science student teachers have the lowest mean score in the first year. This score increases in the second and third years. The mean score on surface approach begins to decrease again in the fourth year.

Table 4 The arithmetical means and standard deviations of scale scores of science student teachers and p (significance level) values according the gender and class level

Class level	Approaches	Gender	N	Mean	SS	p
I	Deep approach	Female Male	21 7	3.19 2.66	0.51 0.28	0.00
	Surface approach	Female Male	21 7	2.37 2.76	0.60 0.72	0.23
II	Deep approach	Female Male	7 12	2.78 2.93	0.45 0.49	0.48
	Surface approach	Female Male	7 12	2.66 2.83	0.71 0.47	0.59
III	Deep approach	Female Male	13 16	2.60 2.84	0.58 0.55	0.27
	Surface approach	Female Male	13 16	2.67 3.01	0.68 0.46	0.13
IV	Deep approach	Female Male	12 20	2.81 2.77	0.67 0.61	0.87
	Surface approach	Female Male	12 20	2.89 2.72	0.45 0.62	0.38

According to Table 4, t-test outputs on gender showed that there is statistically significant difference ($p<0.05$) related to deep approach in the first year. However, there is not statistically significant difference ($p>0.05$) on surface approach. In the second, third and fourth years there is not statistically significant difference ($p>0.05$) on gender for both approaches.

4. Conclusions and suggestions

According to the findings of the study, it is concluded that learning approaches of the science student teachers are different according to class level. The science student teachers' use of a deep approach to learning declined from the first year to the second year, indicating that use of meaningful approaches to learning and enthusiasm declined through the first year. This result is coherent with the study of Gow, et al (1994) sampled 793 students in degree level courses in accountancy and other academic departments at Hong Kong Polytechnic. The declining use of deep approach went on from the second year to the third year. Heavy workloads could have the unintended consequence of discouraging positive attitudes towards learning and encouraging surface approaches. Also lecturers who taught badly could easily induce surface approaches (Spencer, 2003). These factors may cause the declining use of deep approach in the second and third year. The goal of teaching and learning is to assist the student to develop a deep approach to learning. It is important therefore to take into account the fact that higher education requires a higher quality of teaching as well as learning (Pimparyon, et al., 2000)

The use of deep approach increased from the third year to the fourth year. It can be thought that the student teachers' consciousness of responsibility rises during the fourth year. The science student teachers generally have highest score on deep approach. It is encouraging to see that science student teachers generally have a deep approach to learning. This conclusion results from using process based educational approaches instead of knowledge based educational approaches in the university.

According to Entwistle (1995), there are many factors that have an effect on how students approach their learning and studying, include the assessment of students' learning, learning environment, overload of the curriculum, teaching design and the teaching methods. So it is suggested to lecturers to organize appropriate learning activities, ensure students to be active during the learning process and use appropriate assessment practices to assist the student to develop a deep approach to learning.

Learning approaches of science student teachers generally do not change according to the gender. This result is coherent with the other studies on this subject area (Selçuk (Sezgin), et al., 2007; Siddiqui, 2006; Ellez & Sezgin, 2002; Duff, 1999; Wilson, et al., 1996; Richardson, 1993; Miller, Finley & McKinley, 1990).

There can be further studies to examine and determine the reasons of these results on student teachers' learning approaches. Moreover, this kind of studies should be conducted on different student samples.

References:

Berberoğlu, G. & HEI, L. M. (2003). A comparison of university students' approaches to learning across Taiwan and Turkey. *International Journal of Testing, 3*(2), 173-187.

Biggs, J. (1993). What do inventories of students learning process really measure? A theoretical review and clarification. *British Journal of Educational Psychology, 63*, 3-19.

Biggs, J., Kember, D. & Leung, D. (2001). The Revised Two Factor Study Process Questionnaire: R-SPQ-2F. *British Journal of Educational Psychology, 71*, 133-149.

Booth, P., Luckett, P. & Mladenovic, R. (1999). The quality of learning in accounting education: The impact of approaches to learning on academic performance. *Accounting Education, 8*, 277-300.

Byrne, M., Flood, B. & Willis, P. (2001). The relationship between learning approaches and learning outcomes: A study of Irish accounting students. *Accounting Education, 11*(1), 27-42.

Davidson, R. A. (2002). Relationship of study approach and exam performance. *Journal of Accounting Education, 20*(1), 29-44.

Dickie, L. O. (2003). Approach to learning, The cognitive demands of assessment and achievement in physics. *The Canadian Journal Of Higher Education, 33*(1), 87-111.

Duff, A. (1999). Access policy and approaches to learning. *Accounting Education, 8*(2), 99-110.

Duff, A. (2002). Approaches to learning: Factor invariance across gender. *Personality and Individual Differences, 33*, 997-1010.

Eley, M. G. (1992). Differential adoption of study approaches with in individual students. *Higher Education, 23*, 231-254.

Elias, R. Z. (2005). Students' approaches in introductory accounting courses. *Journal of Education for Business*, (3-4), 194-199.

Ellez, M. & Sezgin, G. (2002). Learning approaches of prospective teachers. *Fifth National Science and Mathematics Education Congress, ODTU, Proceedings Book, II*, 1261-1266.

Entwistle, N. J. (1995). *Supporting effective learning: A research perspective.* Edinburgh, Centre For Research On Learning And Instruction, University Of Edinburgh.

Gow, L., Kember, D. & Cooper, B. (1994). The teaching context and approaches to study of accountancy students. *Issues in Accounting Education, 9*(1), 118-130.

Marton, F. & Saljo, R. (1976a). On qualitative differences in learning-I: Outcome and process. *British Journal of Educational Psychology, 46*, 4-11.

Marton, F. & Saljo, R. (1976b). On qualitative differences in learning-II: Outcome as a function of the learner's conception of the task. *British Journal of Educational Psychology, 46*, 115-127.

Miller, C. D., Finley, J. & Mckinley, D. L. (1990). Learning approaches and motives: Male and female differences and implications for learning assistance programs. *Journal of College Student Development, 31*, 147-154.

Nguyen, T. N. (1998). Students' approaches to learning physics in a Vietnamese University. (Master's dissertation, Simon Fraser University)

Pimparyon, P., Poonchai, B., Roff, S., Mcaleer, S. & Pemba, S. (2000). Educational environment, student approaches to learning and academic achievement in athai nursing school. *Medical Teacher, 22*(4), 359-365.

Prosser, M., Walker, P. & Millar, R. (1996). Differences in students' perceptions of learning. *Physics Education, 31*, 43-48.

Richardson, J. T. E. (1993). Gender differences in responses to the approaches to studying inventory. *Studies in Higher Education, 18*(1), 3-13.

Richardson, J. T. E. (1994). *Using questionnaires to evaluate student learning: Some health warnings.* Retrieved from http://www.londonmet.ac.uk/deliberations/ocsld-publications/isltp-richardson.cfm.

Selçuk (Sezgin), G., Çalışkan, S. & Erol, M. (2007). Evaluation of learning approaches for prospective physics teachers'. *Journal of Gazi Education Faculty, 27*(2), 25-41.

Siddiqui, Z. S. (2006). *Study approaches of students in Pakistan: The Revised Two-Factor Study Process Questionnaire experience.* Occasional Report I, December.

Spencer, K. (2003). Approaches to learning and contemporary accounting education. Abstract from *Education in a Changing Environment 17th-18th September 2003 Conference Proceedings.* Retrieved from http://www.ece.salford.ac.uk/proceedings/papers/ks_03.rtf.

Trigwell, K. & Prosser, M. (1991a). Improving the quality of student learning: The influence of learning context and student approaches to learning outcomes. *Higher Education, 22*(3), 251-266.

Trigwell, K. & Prosser, M. (1991b). Relating approaches to study and quality of learning outcomes at the course level. *British Journal of Educational Psychology, 61*, 265-275.

Wilson, K. L., Smart, R. M. & Watson, R. J. (1996). Gender differences in approaches to learning in first year psychology students. *British Journal of Educational Psychology, 66*, 59-71.

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