

## Critical Thinking Dispositions and Problem Solving Skills Among Nursing Students<sup>®</sup>

Ayşe BEŞER\* Aygül KISSAL\*\*

### Abstract

**Objectives:** The aim of this study was to determine critical thinking dispositions and problem solving skills of nursing students at Dokuz Eylül University, School of Nursing and compare the changes in these variables through the four years of nursing education.

**Methods:** This descriptive study included 267 students from Dokuz Eylül University, Nursing of School. Data were collected using two instruments, California Critical Thinking Disposition Scale and Problem Solving Skills Inventory. An additional questionnaire was used to collect demographic data. One Way ANOVA and Pearson correlation analysis were used to analyze data. Tukey HSD test was employed as Post Hoc test. Level of significance was set at  $p < .05$ .

**Results:** Students had moderate critical thinking dispositions and problem solving skills. There was an increase in problem solving skills from the first to the fourth year and there was a negative significant relationship between critical thinking and problem solving skills showing a positive relationship between these two variables.

**Conclusion:** Although increased scores in critical thinking dispositions and decreased scores of problem solving skills may be considered positive, results indicate a need for students' continuous development in these areas. Incorporation of critical thinking and problem solving skills into nursing school curricula can be a beneficial strategy.

**Key Words:** Critical Thinking, Problem Solving, Nursing Education.

### Hemşirelik Öğrencilerinin Eleştirel Düşünme Eğilimi ve Problem Çözme Becerileri

**Amaç:** Bu çalışma Dokuz Eylül Üniversitesi Hemşirelik Yüksekokulu öğrencilerinin eleştirel düşünme eğilimleri ve problem çözme becerilerini belirlemek amacı ile yapılmıştır.

**Yöntem:** Tanımlayıcı tipte olan bu çalışma, İzmir Dokuz Eylül Üniversitesi Hemşirelik Yüksekokulunda 267 öğrenci üzerinde yapılmıştır. Verilerin istatistiksel analizinde SPSS 11.0 paket programında One Way Anova, Post Hoc test olarak Tukey HSD testi ile Pearson korelasyon analizi kullanılmış ve  $p < .05$  anlamlı kabul edilmiştir.

**Bulgular:** Öğrencilerin eleştirel düşünme ve problem çözme becerileri orta düzeyde bulunmuştur. Öğrencilerin problem çözme becerilerinde birinci sınıftan dördüncü sınıfa doğru artış bulunmuştur. Eleştirel düşünme ve problem çözme arasında negatif yönde güçlü ve çok anlamlı bir ilişki saptanmıştır.

**Sonuç:** Bu araştırma sonuçlarına göre öğrencilerin eleştirel düşünme puan ortalamalarındaki artış ve problem çözme puan ortalamasındaki azalma olumlu olarak değerlendirilmesine rağmen bu alanda öğrencilerin devamlı geliştirilmesine gereksinim olduğunu göstermektedir. Hemşire eğitimi tarafından müfredat programlarına eleştirel düşünme ve problem çözme beceri derslerinin entegre edilmesi yararlı bir strateji olabilir.

**Anahtar Kelimeler:** Eleştirel Düşünme, Problem Çözme, Hemşirelik Eğitimi.

\*PhD, Dokuz Eylül University, School of Nursing, Balçova, İnciraltı/İZMİR/TURKEY Telephone: +90 232 4124786 Fax: +90 232 4124798 E-mail: ayse.beser@deu.edu.tr, \*\* MSC, Dokuz Eylül University, School of Nursing

## INTRODUCTION

Technological developments in health, changes in demographics and a rapid increase in scientific knowledge as well as globalization in the 21st century have had a great influence on health services (Kelleci & Gölbaşı, 2004; Simpson & Courtney, 2002). There is an increasing demand for nurses to be prepared with creative and critical thinking skills who are able to provide health services consistent with continuous and rapid developments in the health care environment (Kocaman, Okumuş, Bahar, Kızılcı & Seren, 2003). It has been shown that critical thinking and problem solving skills help nurses to cope with clinical problems, fulfill the requirements of their roles and, thereby, provide efficient and quality health care (Kelleci & Gölbaşı, 2004; Simpson & Courtney, 2002; Tiwari, Avery & Lai, 2003). In addition, it has been shown that critical thinking and problem solving skills of nurses and nursing students could protect patient rights (Adams, 1999). Therefore, nurse educators are responsible for developing curricula directed towards acquisition of knowledge and skills required for critical thinking (Brunt, 2005; Tiwari et al., 2003).

It has been argued that Problem Based Learning (PBL) method is one of the most effective teaching methods for acquisition of critical thinking and problem solving skills (Kocaman et al., 2003; Savery, 2006). PBL was first put into practice in McMaster University in Canada in 1969. In Turkey, it was first started in Dokuz Eylül University of Medical School in the 1997-1998 academic years and Dokuz Eylül University of Nursing School (DEUSON) in the 1999/2000 academic year. PBL is a strategy used to improve critical thinking, problem solving and self learning skills. In contrast to the teacher centered approach of the traditional education system, PBL method emphasizes a student centered approach, active participation of students in classes and creation of a learning environment that can help students adapt to continuously changing health care environment (Kocaman et al., 2003).

In a "Delphi" project organized by American Philosophical Association, an individual with ideal critical thinking abilities was defined as inquisitive, a good counselor, open-minded, tolerant, fair in judgment, unaffected by personal bias, and eager to use common sense in decision making process (Facione, Facione & Sanchez, 1994).

In their work environment, nurses are exposed to large amounts of problems and have to select appropriate action to solve them. They make decisions and put them into action in the presence of numerous inputs. Therefore, it is essential for nurses to make use of critical thinking in solving both the simple and the complex cases they face (Simpson & Courtney, 2002; Tiwari et al., 2003).

## REVIEW OF LITERATURE

There have been numerous studies on critical thinking and problem solving skills in nursing education. Beckie, Lowry and Barnett (2001) found nurses exposed to a curriculum that included courses to improve critical thinking abilities to have higher scores of critical thinking than those who were not exposed to such courses. Although McGrath (2003) reported a gradual increase in critical thinking scores in the first, the second, and the fourth years, she found that the difference between the years was insignificant. However, Stewart and Dempsey (2005) found that the first year nursing students had the highest critical thinking disposition and that there was no

significant increase in their critical thinking abilities after the second year. They attributed lack of a significant increase in critical thinking abilities to the curriculum, learning environment and individual differences. Ip et al. (2000) reported no significant difference in critical thinking scores between the first and the second year students and lower critical thinking scores among the third year students. They attributed the decreased scores in the third year to the curriculum as well as individual, familial and social factors.

Several other studies have compared critical thinking dispositions of nursing students in different nations and in different fields of study. Yeh and Chen (2003), in their comparative study on Chinese and American nursing students, demonstrated that American nursing students had higher critical thinking scores and they ascribed the difference to cultural and sociodemographic differences. Tiwari et al. (2003) compared critical thinking skills between Australian and Chinese nursing students from Hong Kong and found that Australian nursing students had higher critical thinking scores. They explained that the difference might have been due to different educational systems and different cultures. Beşer and Utku (2005), in their study on critical thinking dispositions among Turkish nursing and engineering students, reported that receiving a one year PBL method of instruction improved critical thinking skills of both nursing and engineering students. Similarly, Morales Mann and Kaitell (2001) showed that PBL increased independent learning, critical thinking, and problem solving and communications skills of students. By contrast, Erdem (2001) found no differences in problem solving skills between university graduates exposed to four year traditional nursing education and high school level nursing school graduates exposed to four year traditional nursing education. Gönülal and Bahar (2005), in their study on the effects of PBL on self directed learning and problem solving skills, reported that the first year students had significantly poorer problem solving skills than the second, the third and the fourth year students attributing the improvement to the PBL method used in the program.

Therefore, development and assessment of critical thinking and problem solving skills are important to nursing education (Adams, 1999). It has been argued that instead of traditional education, students centered education models such as the PBL, emphasizing these skills, should be used (Kocaman et al., 2003; Morales Mann and Kaitell, 2001; Tiwari et al., 2003; Youngblood & Beitz, 2001). The aim of this study was to describe problem solving skills and critical thinking skills among the nursing students at Dokuz Eylül University of Nursing School (DEUSON) where PBL has been used since 2000 and to ascertain if there was a relationship between critical thinking skills and problem solving skills. The research questions of this study were as follows:

- 1) What are the problem solving and critical thinking skills of DEUSON students?
- 2) What are the patterns of problem solving and critical thinking skills of DEUSON students through the four years of the nursing program?
- 3) Is there a difference between the four years in the acquisition of these skills?

## METHODS

### *Study Setting*

The study was conducted at DEUSON; the school started to offer a bachelor's degree in the 1994/1995 academic year and initiated the PBL method in the 1999/2000 academic year.

### *Sample*

This is a descriptive study. The sampling frame was 281 students who were in the nursing program at Dokuz Eylül University in the fall term of the 2005/2006 academic year. Out of 281 students, 267 gave informed consent and were included in the study. The mean age of the students was  $21.17 \pm 1.64$  years. About 99% of the participants were female.

### *Ethical considerations*

Approval was obtained from the ethical committee of the nursing school. Interviewers explained the purposes and procedures of the study to the subjects. The students were also informed that data would be confidential and the results would be reported as an aggregate.

### *Instruments*

Two instruments, California Critical Thinking Disposition Scale (CCTDS) and Problem Solving Inventory (PSI) were used to collect data. A demographic questionnaire was used to collect data on such variables as age and school year. Two instruments and demographic questionnaire were obtained by school research database.

### *California Critical Thinking Disposition Scale*

The (CCTDS) is used to evaluate critical thinking disposition, that is, the degree of critical thinking, of individuals (Kökdemir, 2003). The scale was developed by Facione in 1990 and was composed of seven factors. It was a six point Likert scale, ranging from "6= completely agree" to "1=totally disagree", and included 75 questions. Obtaining a score of more than 50 for each factor indicated improved critical thinking disposition, but a score of less than 40 was indicative of poor critical thinking disposition. A score of 280 from the whole scale showed poor critical thinking disposition, but a score of more than 350 showed improved critical thinking disposition. The Cronbach's alpha, internal consistence of the California Critical Thinking Disposition Scale was .92. The Cronbach's alpha of each factor ranged from .71 to .80 (Facione, Facione & Sanchez, 1994).

The validity and reliability of the scale for Turkish population were tested by Kökdemir in 2003. The number of the items was decreased to 51 and included six factors. The Cronbach's alpha value of the whole scale was .88 and the Cronbach's alpha value of each factor ranged from .61 to .78 (Kökdemir, 2003). We found the reliability coefficient of the scale for our sample to be .85. A score of less than 240 showed poor critical thinking and

a score of more than 300 indicated improved critical thinking.

### *Problem Solving Inventory*

The (PSI), used to determine problem solving skills of individuals, was developed by Heppner and Peterson in 1982. The inventory was composed of three factors and 35 items. The Cronbach's alpha value of the inventory was .90 and the Cronbach's alpha value of each factor ranged from .72 to .85. The test retest reliability coefficient, measuring stability of the instrument for each factor, ranged from  $r = .83$  to  $r = .89$  (Savaşır & Sahin, 1997).

PSI can be used to determine problem solving skills of adolescents and adults. It is a six point Likert scale. Total scores range between 32 and 192. Low scores show improved problem solving skills, but high scores show poor problem solving skills. The validity and the reliability of PSI for Turkish population were tested by Savaşır and Sahin in 1997. The Cronbach's alpha reliability coefficient was to be .88 and the split half reliability was found to be .81. Alpha values of the factors ranged from .59 to .78 (Savaşır & Sahin, 1997). We found the Cronbach's alpha of the scale to be .88 for our sample.

### *Data Analyses*

For statistical analysis, oneway ANOVA, Pearson correlation analysis and descriptive analysis were used with SPSS (11.0). Tukey HSD test was employed as Post Hoc test and the level of significance was set at  $p < .05$ .

## RESULTS

Factor analysis of the CCTDS showed that analyticity, open mindedness, inquisitiveness, self-confidence, and truth seeking gradually increased through the first, the second and the third years, but there was a slight decrease in the fourth year compared to the third year. The mean score of the systematicity increased through the first, the second, the third and the fourth years (Table 1). There was a significant difference in the mean scores obtained from the following factors: analyticity, open mindedness, inquisitiveness, self-confidence, truth seeking, systematicity during the four years ( $F=3.186, p<.05$ ;  $F=4.468, p<.05$ ;  $F=10.258, p<.05$ ;  $F=11.700, p<.05$ ;  $F=3.128, p<.05$ ;  $F=12.132, p<.05$  respectively).

There was a gradual increase in critical thinking scores from the first year to the third year. The fourth year students showed higher critical thinking scores than the first and second year students; however, the mean score of  $280.56 \pm 1.35$  was slightly lower than the mean scores of the third year students. Students at all years had a moderate critical thinking disposition (Table 1). There was a significant difference in critical thinking scores between the years, which was caused by the scores of the second and third year students ( $F=15.586, p<.05$ ).

**Table 1. Analysis of Variance for California Critical Thinking Disposition Subscale and Total Scores by the Years of the Students**

Factors	Years				F	p
	First Year X ± SD	Second Year X ± SD	Third Year X ± SD	Fourth Year X ± SD		
Analyticity	48.82±4.67	49.28±7.12	51.03±4.43	50.75±4.44	3.186	.024
Open mindedness	43.95±3.79	44.60±4.30	45.18±4.68	46.71±5.05	4.468	.004
Inquisitiveness	45.34±5.86	45.66±7.59	49.68±5.43	49.10±4.49	10.258	.000
Self-confidence	40.24±5.90	40.61±8.32	45.21±5.91	45.02±6.36	11.700	.000
Truth-seeking	43.58±5.08	42.61±5.37	45.36±5.41	44.20±5.26	3.128	.026
Systematicity	41.25±4.36	41.44±4.74	44.37±3.97	44.76±4.51	12.132	.000
Total	263.20±18.79	264.23±24.49	280.85±19.58	280.56±19.84	15.586	.000

\*All significant at the p=0.05 level

We next analyzed the data on problem solving scores. The mean scores of the following factors gradually decreased through the first, the second, the third and the fourth years with a statistically significant difference between the years: impulsive style, reflective style, avoidant style, monitoring, problem solving confidence, and planfulness (F= 8.120, p< .001; F= 9.156, p< .001; F= 8.230, p< .001; F=9.413, p < .001; F= 17.025, p<.001; F=

17.935, p< .001 respectively), showing increased problem solving skills (Table 2).

There was a significant difference in problem solving scores between the first, the second, the third and the fourth year students (p<.001). The difference originated from the scores of the second and the third year students. Decreased scores towards the fourth year showed improved problem solving skills (Table 2).

**Table 2. Analysis of Variance for Problem Solving Scores Subscale and Total Scores by the Years of the Students**

Factors	Years				F	p
	First year X ± SD	Second year X ± SD	Third Year X ± SD	Fourth year X ± SD		
Impulsive Style	26.20±3.95	24.67±5.56	24.38± 4.83	22.30±3.95	8.120	.000
Reflective Style	12.12±3.50	11.75±3.95	9.85±2.98	9.62±3.65	9.156	.000
Avoidant Style	8.91±2.55	9.77±3.56	7.84±3.31	7.10±3.11	8.230	.000
Monitoring	7.46±2.21	7.11±2.57	6.02±2.25	5.71±2.03	9.413	.000
Problem-Solving Confidence	15.28±4.73	14.24±4.23	11.59±3.59	11.12±3.47	17.025	.000
Planfulness	10.23±3.01	9.15±2.88	7.61±2.49	7.25± 2.60	17.935	.000
Total	94.19±15.04	91.30±17.11	81.93±14.62	78.32±14.05	16.472	.000

\*All significant at the p=0.05 level

As shown in Table 3, there was a very significant negative relationship between critical thinking and problem solving scores in the first and the second years (r =-.65, p<.001; r=-.63, p<.001 respectively). In addition,

there was a significant negative relationship between critical thinking and problem solving skills of the third and the fourth year students. ( r=-.48, p < .001; r = -.44, p < .001).

**Table 3. The Relationship between Critical Thinking Disposition and Problem Solving Scores**

Years	Mean Critical Thinking Disposition Scores	Mean Problem Solving Scores	r	p
First Year	263.20	94.19	-.65	.000
Second Year	264.23	91.30	-.63	.000
Third Year	280.85	81.93	-.48	.000
Fourth Year	280.56	78.32	-.44	.001

\*All significant at the p=0.05 level

## DISCUSSION

Analyticity means being able to foresee potential problems and to make use of objective evidence in the face of complicated problems (Kökdemir, 2003). In the present study, the students received moderate scores of analyticity in the first, the second and the fourth years, but high scores in the third year, with a significant difference in the fourth year ( $F=3.186$   $p < .05$ ). The difference resulted from significantly lower analyticity scores of the first year students in comparison with the third year students. McGrath (2003) and Ip et al. (2000) also reported moderate scores of analyticity, but Kawashima and Petrini (2004) reported low scores of analyticity. Beşer and Utku (2005) noted that the first year nursing students received moderate scores of analyticity. In the present study, the higher scores of analyticity obtained in the third year can be explained by the fact that nursing student become accustomed to brainstorming about potential problems, learn to test their assumptions against data and then apply their knowledge in clinics with the guidance of nursing instructors.

The students also received a gradually increasing scores of open mindedness, with a significant difference between the years ( $F= 4.468$ ,  $p < .05$ ). The difference was due to significantly lower scores of the first year students in relation to the fourth year students. Beşer and Utku (2005) also found the first year students to have moderate scores of open mindedness. By contrast, Tiwari et al. (2003) reported that Chinese nursing students obtained low scores of open mindedness, but that Australian students received moderate scores of open mindedness. Open mindedness is a predictor of individuals' tolerance to different approaches and individuals' ability to recognize their own mistakes. Ideally, these are the features that students would be expected to acquire. In the present study, increased scores of open mindedness in the third year may indicate that students became more tolerant of different points of view and recaptive to the recognition of their own mistakes. These findings suggest that school's curriculum, and the method of teaching, allow students to express their opinions freely and reflect on their own views. However, although students increased their scores for open mindedness, the increase was statistically insignificantly. This finding has implications for the curriculum in that it could be revised to encourage open mindedness to a greater extend.

Inquisitiveness reflects the tendency to obtain information and learn new things without self-interest. All students had moderate inquisitiveness and there was a significant difference between the years ( $F= 10.258$ ,  $p < .001$ ). Further, analyses showed that the difference was due to significantly lower scores of the first and the second year students in relation to the third and the fourth year students.

Enabling students to be inquisitive is of great importance in nursing education. An inquisitive student can critique the problem she/he faces and reaches new insight. In the present study, inquisitiveness of the students increased throughout their second half of their four year education, though moderately. Higher scores particularly among the third and fourth year students can be explained by their exposition to a wide variety of diverse situations during their education.

The participants in this study also showed a moderate level of self-confidence and there was a signi-

ficant difference between the years ( $F=11.700$ ,  $p < .001$ ). The difference was caused by significantly lower scores of self-confidence between the first and the second year students than the third and the fourth year students. By contrast, Beşer and Utku (2005), Kökdemir (2003), Kawashima and Petrini (2004) and Ip et al. (2000) had reported low self-confidence in their subjects. Although students in our study already had moderate level of self-confidence at the beginning of school, the evident improvement throughout the four years of education is rather expected.

Truth-seeking is an ability to identify alternatives or different points of views. In this study, all students had a moderate truth seeking ability and there was a significant difference between the years ( $F: 3.128$ ,  $p < .05$ ). The difference was due to significantly lower scores of the second year students in relation to the third year students.

Several studies have shown that nursing students have poor truth seeking abilities (McGrath, 2003; Ip et al., 2000; Walsh & Hardy, 1999). Walsh and Hardy (1999) attributed this to the fact that students in general, were inflexible in seeking different points of view. However, truth seeking plays an important role in the decision making process and therefore, In this study, the students, particularly the third year students, had increased scores for truth seeking. Truth seeking is a skill that needs to be a focus of improvement through the years of nursing education.

Systematicity is a tendency to conduct organized, planned and careful investigations. In this study, the students showed a moderate level of systematicity and there was a significant difference years the years ( $F= 12.132$ ,  $p < .001$ ). The difference resulted from significantly lower scores of the first and the second year students than the third and the fourth year students. Although Kawashima and Petrini (2004) found low systematicity among the students they studied, our results are similar to those reported by McGrath in 2003 that a moderate level of systematicity existed in nursing students.

Systematicity plays an important role in professional decision making. In the present study, scores of systematicity gradually increased towards the fourth year. This may have been caused by the improved ability of the students to perform organized, well-planned and careful investigations. To increase the quality of decision making process and systematicity towards problem solving, at the DEUSON students are assigned complex cases in clinical setting where they are asked to analyze these complex cases and expected to make use of decision making process in solving clinical problems.

In terms of critical thinking, the first, the second, the third, and the fourth year students had moderate scores of total critical thinking. More significantly, critical thinking scores gradually increased through the years, showing a steady but a significant improvement in the third and the fourth year. There was a slight, but statistically insignificant, decrease in critical thinking scores in the fourth year compared to the third year students. Unlike our findings, McGrath (2003) found moderate critical thinking skills in his sample of nursing students, with no significant difference between the years. Similarly, Walsh and Hardy (1999) found moderate critical thinking skills in nursing students. As discussed before, Tiwari et al. (2003) reported Australian nursing students to have more improved critical thinking skills than Chinese

nursing students although both groups of the students were exposed to PBL. Ip et al. (2000) also reported no significant difference in critical thinking scores of the first and the second years, and in fact, third year students had lower scores than the rest of the students.

In this study, total problem solving scores decreased towards the fourth year of school (Table 2), suggestive of improved problem skills. Except for mean scores of Avoidant Style, mean scores of other problem solving factors decreased towards the fourth year of school and there was a significant difference in scores of Impulsive Style, Reflective Style, Avoidant Style, Monitoring, Problem Solving Confidence and Planfulness between the years ( $F= 8.120, p< .001$ ;  $F= 9.156, p< .001$ ;  $F= 8.230, p< .001$ ;  $F= 9.413, p< .001$ ;  $F= 17.025, p< .001$ ;  $F= 17.935, p< .001$  respectively). These decreases in problem solving scores through the years indicate an improvement in problem solving skills. The finding of increased problem solving skills throughout the years in this sample may have been due not only to individual and environmental characteristics but also to the PBL. Uys et al. (2004) and Kocaman et al. (2003) reported nurses exposed to PBL at school had better problem solving skills than those exposed to traditional education.

In this study, we also found a significant negative relationship between critical thinking disposition and problem solving scores ( $r= -.62, p< .001$ ). The finding of the significant relation between critical thinking and problem solving skills is not unusual. Attempts to solve problems are directly related to cognitive processes. Clinical instructors at DEUSON direct students towards asking questions, solving problems and comparing their own opinions and beliefs with others and make associations between pieces of knowledge. These teaching strategies might contribute to students' cognitive development and inoculate positive attitude towards critical thinking and problem solving.

#### LIMITATIONS OF THE STUDY

Only one school and only those that were exposed to PBL were included in this study. Therefore, further studies that include several control groups are needed to assess the critical thinking disposition and problem solving skills of nursing students.

#### CONCLUSION

Problem solving is a part of critical thinking and critical thinking improves problem solving skills. Since both nursing students and nurses experience numerous problems in the clinics, it is important to improve critical thinking and problem solving skills. In this study, improved critical thinking and problem solving skills through the years were found among students who were exposed to PBL. However, studies with control groups are needed to corroborate our findings.

Although the first, the second, the third and the fourth year students at Dokuz Eylül University of Nursing School had moderate critical thinking and problem solving skills, their skills varied within the years. In fact, there was a significant negative relation between critical thinking and problem solving skills suggest that the higher the critical thinking skills the better the problem solving skills. Critical thinking and problem solving may be intimately linked because they both require active participation and mental agility. Critical thinking skills and problem solving

skills are acknowledged as critical for current nursing practice.

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