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# The effects of portfolio and learning style-based practices on biology attitudes of pre-service science teachers

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**Abstract**

The aim of this research is to examine the effects of course activities with learning styles and portfolio applications on the attitudes of pre-service science teachers towards biology lesson. The research was studied with 100 teacher candidates in the 2nd grade of Science Teaching at Ondokuz Mayıs University. The learning styles of the prospective teachers were determined according to the Kolb Learning Styles Inventory (KÖSE-3), and lesson plans were created within the scope of the General Biology Laboratory course, and also teaching activities which used portfolio evaluation were developed. In this context, the effect of the taught course on the attitudes of pre-service science teachers towards the biology course was examined. The design of the research is quasi-experimental design with pre-test post-test control group (model with unequalized control group). One of the branches of the pre-service science teachers' class was chosen as Experiment1 group, one as Experiment 2 and one as Control group. At the end of the period, it was found that the applications which was completed in a total of 28 weeks were more effective in the attitudes of pre-service science teachers in both experimental groups towards the biology lesson.

***Keywords:*** Portfolio, learning styles, biology education, attitude.



## 1. Introduction

A large number of studies have been conducted and are still being conducted so that learning can take place in the easiest, most understandable, most usable and most permanent way. The use of portfolio in education has increased both because of its effect on learning in the learning process and because it provides an opportunity for multi-dimensional evaluation in the measurement and evaluation phase. In today's world where the importance of attaining 21st century skills is gradually increasing, the effects of

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portfolio application on these attainments are being discussed. While individuals in the learning process are expected to channel themselves, it is also considered very important for them to gain their own learning skills in this direction.

### *1.1 Using portfolios*

Portfolio, which is one of the alternative measurement and evaluation methods in which students can be monitored and feedback can be received and given in the learning process, also aims to provide educational areas (cognitive, affective and psychomotor). It is possible to monitor students' learning and to monitor developmental stages in this process by spreading over time. Even when considered from this perspective, portfolio is expected to be used more widely in education.

A large number of definitions have been made for portfolio, one of which was made by Baki and Birgin (2004). According to Baki and Birgin (2004), portfolios are obtained by a systematic collection of students' works; they provide information about students' abilities, strengths, achievements, development in this process and their areas of need and they allow students to be evaluated as a whole since they provide visual and dynamic evidence to their environment.

One of the most important advantages of portfolio assessment process is the fact that students can choose the learning outcomes themselves. Students have an active role in both choosing the content and determining the selection criteria. This active participation of students is emphasized within the process and their attention, interest and learning products are exhibited (Chang, 2001; Tezci&Dikici, 2002). With this self-evaluation opportunity given to students, students are helped to produce good quality works in this process. It is also seen as a suitable environment to increase the self-confidence and self-esteem values of students.

When the literature is reviewed, it can be seen that portfolios were developed and began to be used as an alternative assessment tool starting from 90s (Belanoff &Dickson, 1991; Odabaşı Çimer, 2011) and then its use became widespread in many educational fields and levels. In some studies, conducted on nursing and medicine, it can be seen that portfolios are used to increase the permanence of students' knowledge as an assessment method (Dyne, Strauss & Rinnert, 2002; Tiwari & Tang, 2003; Rees, 2004). Similarly, there are studies in literature on biology in which portfolios were used within the context of topics such as evolution (Matthews, 2001), skeletal system (Bahçeci & Kuru, 2006) and human circulatory system (Sungur & Tekkaya, 2003). There are also studies on the use of teacher portfolios and the professional advantages they provide (Zepeda, 2016; Toptaş, 2017; Demirkan, 2019; Avan & Şahin, 2020). In a study conducted by Şaşmaz-Ören et al. (2020),

students' views were taken on the use of portfolio assessment file and as a result, portfolio application was considered as important by students.

*1.2 Using applications with different learning styles*

Learning styles came to the fore in the 1960s by Rita Dunn. Dunn and Dunn (1993) defined learning style based on environmental differences rather than psychological and mental processes; they stated that learning styles were specific ways which diversified according to individuals, which enabled students to focus on the subject and the process while acquiring knowledge and experience and thus enable them to acquire knowledge more easily. They stated that individuals learn by using different ways and the educational environment, method and resources used may not have the same effect on every individual. In short, learning style includes finding out which teaching or studying style is the most effective in the learning process (Yıldız, 2016). Due to individual differences of learners, it cannot be expected for each of the program, aim, goal and method selection in the learning process to create the same effect on each student or to show the same results for different situations. Learning styles are also included in these individual differences. This difference, which includes the unique learning of learners, is called learning style (Özgen & Alkan, 2014).

In many studies conducted, it can be seen that the classification of learning styles differs. Experiential Learning Theory, which is structured by the learning styles developed by David Kolb, is very common for higher education. Considering that learning is based on individuality, Kolb developed Learning Styles Inventory (LSI) to evaluate personal orientations. According to this model, learning styles of individuals are in a cycle and they have four dimensions as "concrete experience", "abstract conceptualization", "active experimentation" and "reflective observation". What is important is that students need to use these four dimensions to be effective (Kolb, 1984). Learning styles preferred for each dimension are also different. These are "by feeling for concrete experience", "by doing for active experimentation", "By thinking for abstract conceptualism" and "by monitoring for reflective observation" (Ekici, 2002; Karagöz Bolat, 2007). Since Kolb model is based on these stages, an environment is also created for individuals to get to know themselves better through activities conducted in different ways (Bradbeer, 1999; Leigh, 2011).

When studies conducted on learning styles were reviewed, it was found that there are more studies that research the relationship between learning styles and achievement than studies researching the relationship between learning styles and attitudes towards lesson. Relationships between individuals' learning styles and their level of education, occupation, gender, age and learning environments were also analyzed (Mathews, 1996; Ching-Chun & Julia, 2001; Bilgin & Bahar, 2002). Another study examined the relationship between learning styles and attitudes towards teaching profession (Fadlelmula-Kayan, 2015). It was also researched whether individuals' learning styles affected their attitudes towards lesson (Christou & Dinov, 2010; Çalışkan & Kılıç, 2012). Karadeniz-Bayrak (2014)

examined learning styles and attitudes towards science and technology. In Türkiye, studies using Kolb's LSs started in 1991. Kolb LSI was translated into Turkish and studies which use Kolb's learning styles are still continuing (Aşkar & Akkoyunlu, 1993; Gencel Evin, 2007). One of the study topics related with learning styles is studies examining the relationship between ways of learning that constitute learning styles of pre-service teachers and their critical thinking tendencies (Koç-Erdamar & Bangir-Alpan, 2017; Kutluca, Yılmaz & İbiş, 2018; Kiriş-Avaroğulları & Şaman, 2020).

Knowing about the learning styles of students provides many benefits. It is thought that this will facilitate determining the teaching strategy, method and techniques that can be used from planning to applying teaching and selecting the related teaching materials (Peker & Aydın, 2003). When the differences in students' learning are considered, learning takes place in the best way possible. However, it is emphasized that finding the most appropriate learning way specific for the individual will be possible also with a suitable learning environment (Tuna, 2008). Similarly, Mutlu and Aydoğdu (2003) point out that effective and efficient education can take place with practices that will appeal both to learning styles and individual differences of students.

*1.3 Changing attitude*

The term attitude brings to mind both physical state and potential behavioral concepts. Different definitions of attitude have been made according to existing learning theories (Atasoy, 2002). According to Anderson, attitude is a moderate level of excitement that makes the individual inclined or prepared for any response, appropriate or not, upon encountering a particular object (Anderson, 1988). In addition to being the readiness condition of an activity, attitudes are also the basis of many thoughts and behaviors in the minds of individuals (Phillips, 2003).

In studies examining the relationship between students' learning styles and biology attitudes, Çakır et al. (2002) and Köseoğlu (2009) concluded that biology attitudes did not differ in terms of learning styles. Similarly, in a study conducted by Yapıcı and Hedevanlı (2012), it was concluded that there were no significant differences between pre-service teachers' learning styles and their self-efficacy beliefs for biology teaching.

When the literature is reviewed, it can be seen that the present study is an important study since there are no experimental studies on General Biology Laboratory conducted in literature in which portfolio is used with suitable lesson plan after pre-service teachers' learning styles are determined. The present study is also important because it is a

systematic study in which learning styles and portfolio application is carried out according to Kolb Experiential Learning Theory.

The aim of the present study is to examine the effects of teaching in accordance with learning styles and portfolio application on biology attitudes of pre-service science teachers.

For this purpose, answers to;

- What are the learning styles distribution of pre-service science teachers in pre-test and post-test?
- Is there significant difference between the attitudes of the experimental groups and control group pre-service science teachers towards the biology course in the General Biology Laboratory?

## 2. Method

A quantitative data collection tool was used to collect data in the present study which was conducted to find out the effects of portfolio and teaching in accordance with learning styles on the attitudes of pre-service teachers towards biology lesson. Experimental model with pre-test and post-test control group was used in the study and the study was conducted with quasi-experimental research method. In studies conducted with quasi-experimental design, individuals to be included in experimental and control groups are not selected randomly (Campbell and Stanley, 1963). Quasi-experimental design with pre-test and post-test control group (unequal control group model) was used in the study. As required by unequal control group model, while determining the groups, care was taken to ensure that the groups were as similar as possible, and which group would be the experimental group and which one would be the control group was selected with random assignment group (Karasar, 2006). Control and experimental groups of our study were determined randomly, while the pre-service teachers in groups were not distributed randomly. Two of the three different classes at Ondokuz Mayıs University Science Teaching Program including second year students were selected as the experimental group, while one was selected as the control group. While the pre-service teachers in the two experimental groups continued their education with different applications, pre-service teachers in the control group continued their education without a special application. Portfolio application was carried out in Experimental Group 1 and Experimental Group 2 within the scope of General Biology Laboratory course “Animal and Plant Tissues” subject. In addition, a lesson chart suitable for the learning styles of Experimental Group 2 pre-service teachers and portfolio was continued in parallel with this. The first part of the application continued for a total of 20 weeks, 10 weeks in the first term and 10 weeks in the second term. The application took a total of 40 lesson hours since weekly laboratory hours were 2 hours. In addition, pre-service teachers were interviewed at intervals about

the studies they put in their portfolios in some weeks. The application part of the study was completed in 28 weeks with pre-test and post-test application.

### *2.1. Study sample*

The study was conducted with 100 pre-service teachers attending their second year at Ondokuz Mayıs University Science Teaching department. The distribution of pre-service teachers by groups and genders is shown in Table 1.

Table 1: Distribution of pre-service teachers by groups and genders

| Groups | Experimental 1 | Experimental 2 | Control | Total |
|---|---|---|---|---|
| **Females** | 30 | 22 | 23 | 75 |
| **Males** | 5 | 10 | 10 | 25 |
| **Total** | 35 | 32 | 33 | 100 |

A total of 35 students in the Experimental Group 1, 30 females and 5 males; a total of 32 students in the Experimental Group 2, 22 females and 10 males; and a total of 33 students in the control group, 23 females and 10 males, participated in the study.

### *2.2. Application topics of the study*

Application topics of the study are given in Table 2, respectively.

Table 2: Application topics of the study

| Weeks | First Term | Second Term |
|---|---|---|
| 1 | Mitotic Division | Ergastic Materials/ Plastids/ Sectionalization |
| 2 | Meiosis Division | Epidermis/ Feathers |
| 3 | Zygote Formation/ Development Stages | Stoma/ Fungal Tissue |
| 4 | Epithelial Tissue | Parenchymatic Tissues |
| 5 | Secretory Tissue | Secretory Tissue |
| 6 | Connective Tissue | Support Tissue |
| 7 | Fat Tissue | Vascular Tissue |
| 8 | Blood Tissue | Meristematic Tissue |
| 9 | Cartilage and Bone Tissue | Meristematic Tissue |
| 10 | Muscle Tissue | Stem-Leaf-Flower |

### *2.3 Data analysis*

Cronbach Alpha reliability coefficients of the learning styles dimensions of the study were found to range between 0,70 and 0,78. The inventory consists of 12 items with 4 options asking individuals to rank the four learning styles that best describe their learning styles. The sum of the scores given by respondents to each question as 1, 2, 3, 4 (1: most important - 4: least important) varies between 12 and 48. The next step is obtaining the

combined scores. Combined scores vary between -36 and +36. With the combined scores, scores are created for four basic learning styles as concrete experience (CE), reflective observation (RO), Abstract Conceptualization (AC) and Active Experimentation (AE) in the learning cycle of students. The point where the combined scores intersect on the x-y axis in the score graph of the model KLSI III Coordinate System (Kolb, 1999).

Biology Attitude Scale used in the study is a 5 Likert type Scale and the items are responded as "Strongly agree", "Agree", "Undecided", "Disagree" and "Strongly disagree". The positive items in the Scale are scored as 5, 4, 3, 2, 1 starting from the expression "Strongly agree", while the negative items are scored as 1, 2, 3, 4, 5 (reverse coding). The scores obtained from Biology Attitude Scale pre-test and post-test were calculated and analyzed with SPSS 13 program.

The maximum possible score a pre-service teacher can get from the Biology Attitude Scale used in the study is 180, while the minimum possible score is 36. In Biology Attitude Scale normality analysis, Kruskal Wallis was used for the analysis of pre-test data which were not normally distributed, while One Way Anova was used for the post-test data which were normally distributed. Wilcoxon test was used in the analysis of the scores taken from Biology Attitude Scale pre-test and post-tests of pre-service teachers.

## 3. Results

### *3.1. Statistics and data analysis*

Table 3 shows the pre-test and post-test learning styles distributions of pre-service teachers in the Experimental Group 1, Experimental Group 2 and Control Group according to Kolb Learning Styles Inventory.

Table 3: Pre-test and post-test learning styles distributions of pre-service teachers

| | Groups | Experimental 1 | | Experimental 2 | | Control | | Total | |
|---|---|---|---|---|---|---|---|---|---|
| Test | Styles | f | % | f | % | f | % | f | % |
| pre Test | Converging | 17 | 48.6 | 9 | 28.1 | 13 | 39.4 | 39 | 39.0 |
| | Diverging | 1 | 2.9 | 6 | 18.8 | 7 | 21.2 | 14 | 14.0 |
| | Assimilating | 15 | 42.9 | 13 | 40.6 | 11 | 33.3 | 39 | 39.0 |
| | Accommodation | 2 | 5.7 | 4 | 12.5 | 2 | 6.1 | 8 | 8.0 |
| | Total | 35 | 100.0 | 32 | 100.0 | 33 | 100.0 | 100 | 100.0 |
| post Test | Converging | 17 | 48.6 | 10 | 31.3 | 14 | 42.4 | 41 | 41.0 |
| | Diverging | 2 | 5.7 | 7 | 21.9 | 9 | 27.3 | 18 | 18.0 |
| | Assimilating | 15 | 42.9 | 13 | 40.6 | 9 | 27.3 | 37 | 37.0 |
| | Accommodation | 1 | 2.9 | 2 | 6.3 | 1 | 3.0 | 4 | 4.0 |
| | Total | 35 | 100.0 | 32 | 100.0 | 33 | 100 | 100 | 100.0 |

In the pre-test, it was found that 48.6% of the pre-service teachers in the Experimental Group 1 had converging learning style, while 42.9% had assimilating learning style and the highest student frequency was found in these styles. Similarly, it was found that 28.1% of the pre-service teachers in the Experimental Group 2 had converging learning style, while 40.6% had assimilating learning style. In the control group, 39.4% of the pre-service teachers had converging learning style, while 33.3% had assimilating learning style.

It was found that these rates did not change much in the post-test. It was found that 48.6% of the pre-service teachers in the Experimental Group 1 had converging learning style, while 42.9% had assimilating learning style; 31.3% of the pre-service teachers in the Experimental Group 2 had converging learning style, while 40.6% had assimilating learning style; of the pre-service teachers in the control group, 42.4% converging learning style, 27.3% had diverging learning style and 27.3% had assimilating learning style.

For biology attitude scale analysis of pre-service teachers, it was first of all examined whether they were normally distributed. As the first step, the data were analyzed in terms of form, Skewness and Kurtosis values were analyzed in the second step and Shapiro-Wilk test was applied to data in the third and last step. Biology attitude scale pre-test and post-test Shapiro-Wilk test values of the groups are shown in Table 4.

Table 4: Biology attitude scale Shapiro-Wilk test values of the groups

| | Groups | Skewness | Kurtosis | Shapiro-Wilk p |
|---|---|---|---|---|
| Pre-test | Experimental 1 | -1.663 | 3.870 | .000* |
| | Experimental 2 | -1.865 | 3,659 | .000* |
| | Control | -1.019 | 1.422 | .037* |
| Post-test | Experimental 1 | .021 | -1.252 | .073 |
| | Experimental 2 | .463 | -.851 | .065 |
| | Control | .064 | -.758 | .363 |

*: $p < .05$

While all of the post-test Shapiro-Wilk values of the groups are normally distributed ($p > .05$), pre-test Shapiro-Wilk values of the groups are not normally distributed ($p < .05$). For this reason, biology attitude scale pre-test data were analyzed with non-parametric tests, while post-test data were analyzed with parametric tests.

The results of Kruskal Wallis Test, which was performed for Biology Attitude Scale pre-test scores of the Experimental Group 1, Experimental Group 2 and Control Group pre-service teachers are shown in Table 5.

Table 5: Kruskal Wallis Biology Attitude Scale pre-test scores of pre-service teachers according to groups

| Groups | N | Rank Average | Sd | $X^2$ | p |
|---|---|---|---|---|---|
| Experimental 1 | 35 | 48.20 | | | |
| Experimental 2 | 32 | 55.64 | 2 | 1.480 | .477 |
| Control | 33 | 47.95 | | | |

*: $p < .05$

No statistically significant difference was found between Biology Attitude Scale pre-test scores of the Experimental Group 1, Experimental Group 2 and Control Group pre-service teachers [X2= (2) = 1.480, p> .05]. This result shows that it is appropriate to make comparisons between groups whose biology attitudes were close to each other before the application.

Wilcoxon Signed Ranks Test results, which were conducted separately for Biology Attitude Scale pre-test and post-test scores of pre-service teachers, are shown in Table 6, Table 7 and Table 8, respectively.

Table 6: Wilcoxon Signed Ranks Test results for Biology Attitude Scale pre-test and post-test scores of pre-service teachers in Experimental Group 1

| Post test – Pre test | N | Rank Average | Sum of Rank | Z | p |
|---|---|---|---|---|---|
| Negative ranks | 4 | 10.25 | 41.00 | | |
| Positive ranks | 31 | 19.00 | 589.00 | -4.489 | .000* |
| Equal | 0 | | | | |

*: $p < .05$

Statistically significant difference was found between Biology Attitude Scale pre-test and post-test scores of pre-service teachers in Experimental Group 1 [z = -4.489, p < .05]. The fact that positive rank means (19.00) of the pre-service teachers in the group were higher than the negative rank means (10.25) shows that the significant difference is in favor of the post-test.

Table 7: Wilcoxon Signed Ranks Test results for Biology Attitude Scale pre-test and post-test scores of pre-service teachers in Experimental Group 2

| Post test – Pre Test | N | Sıra Ortalaması | Sıra Toplamı | Z | p |
|---|---|---|---|---|---|
| Negative ranks | 7 | 10.71 | 75.00 | | |
| Positive ranks | 24 | 17.54 | 421.00 | -3.391 | .001* |
| Equal | 1 | | | | |

*: $p < .05$

Statistically significant difference was found between Biology Attitude Scale pre-test and post-test scores of pre-service teachers in Experimental Group 2 [z = -3.391, p < .05]. The fact that positive rank means (17.54) of the pre-service teachers in the group were

higher than the negative rank means (10.71) shows that the significant difference is in favor of the post-test.

Table 8: Wilcoxon Signed Ranks Test results for Biology Attitude Scale pre-test and post-test scores of pre-service teachers in Control Group

| Post test – Pre test | N | Rank Average | Sum of Rank | Z | p |
|---|---|---|---|---|---|
| Negative ranks | 8 | 11.88 | 95.00 | | |
| Positive ranks | 25 | 18.64 | 466.00 | -3.316 | .001* |
| Equal | 0 | | | | |

*: $p < .05$

Statistically significant difference was found between Biology Attitude Scale pre-test and post-test scores of pre-service teachers in the Control Group [$z = -3.316$, $p < .05$]. The fact that positive rank means (18.64) of the pre-service teachers in the group were higher than the negative rank means (11.88) shows that the significant difference is in favor of the post-test.

One Way Anova Test results for Biology Attitude Scale post-test scores of pre-service teachers in Experimental Group 1, Experimental Group 2 and Control Group are shown in

Table 9: One Way Anova Test results for Biology Attitude Scale post-test scores of pre-service teachers

| Source of Variance | Sum of Squares | Sd | Mean Squares | F | p |
|---|---|---|---|---|---|
| Between groups | 1449.753 | 2 | 724.876 | | |
| Within group | 16836.868 | 97 | 173.576 | 4.176 | .018* |
| Total | 18286.621 | 99 | | | |

*: $p < .05$

Statistically significant difference was found between Biology Attitude Scale post-test scores of pre-service teachers in Experimental Group 1, Experimental Group 2 and Control Group [$F = 4.176$, $p < .05$].

Table 10 shows the results of Scheffe test, which was performed to find out between which groups the difference was.

Table 10: Scheffe Test results for Biology Attitude Scale post-test scores of pre-service teachers

| **Groups** | | **Average Difference** | **p** |
|---|---|---|---|
| Experimental 1 | Experimental 2 | -.21880 | .998 |
| Experimental 2 | Control | 8.20959 | .047* |
| Control | Experimental 1 | -7.99079 | .048* |

*: $p < .05$

While no statistically significant difference was found between Experimental Group 1 and Experimental Group 2 ($p > .05$), significant difference was found between Experimental Group 2 and Control Group ($p < .05$) and Control Group and Experimental Group 1 ($p < .05$). The result that the mean

difference between Experimental Group 2 and Control Group was positive shows that the significant difference was in favour of Experimental Group 2, while the result that the mean difference between Control Group and Experimental Group 1 was negative shows that the significant difference was in favour of Experimental Group 1.

## 4. Discussion

When the pre-test scores of Biology Attitude Scale used in the study were examined, no statistically significant difference was found (Table 5). According to the analysis results in Table 6, 7 and 8, statistically significant difference was found between the pre-test and post-test scores of each group and it was found that this difference is in favour of post-tests. This result shows that there was a positive increase in Biology attitudes of pre-service teachers in our study groups after General Biology Laboratory course was taught. When the post-test Biology Attitude Scale scores of the groups are examined, statistically significant difference can be seen between Experimental Group 1 and Control Group and Experimental Group 2 and Control Group (Table 9 and Table 10). According to this result, it can be said that the increase in biology attitudes of Experimental Group 1 and Experimental Group 2 were higher than Control group after General Biology Laboratory course was taught.

According to the results found in a study conducted by Orhan (2007), science attitudes of students were found to increase in groups in which alternative measurement and assessment methods were applied. Similarly, there are a large number of study results which show that portfolio assessment, which is one of the alternative measurement and assessment methods, increases attitudes of students towards lessons (Okan, 2005; İnce, 2007; Mıhladız, 2007). In a study in which portfolio was used with seventh graders, Okan (2005) showed that the students began to think that science lesson was interesting, enjoyable and fun. Similarly, Mıhladız (2007) found that when portfolio was used with sixth graders, students developed positive attitudes towards the lesson and these positive attitudes enabled students to learn in a more interesting and fun way. These positive results are thought to be due to the fact that they could determine the subject according to the field of intelligence and the positive feedback they received with teacher guidance, which in turn caused the development of self-confidence. Bedir, Polat and Sakacı (2009) found that portfolio use increased students' attitudes towards the lesson to some extent, although not fully, and this increase was reflected positively on students' motivation towards the lesson.

Erdoğan (2006), found that university students who were taught with portfolio liked portfolio, they made efforts to produce more qualified products during the preparation stages of their portfolios, they took more responsibility in the learning process and these were reflected as positive attitudes on their lessons. It was also stated in this study that

these positive attitudes of the students may have resulted from the fact that they experienced the process of self-assessment and they made contributions.

Results of studies conducted show that portfolio is a popular and preferred method in lessons, students start to have partial or totally positive attitudes towards the lesson. It is possible for students who are directed to subjects of content they like freely to be more interested in the lesson. Especially secondary education students may influence the individuals they receive help from with their interest and curiosity while conducting their research. Thus, it is expected that the positive processes experienced by students will create continuity thanks to the feedback they receive from other people around them. In addition to all these interactions, the main reason why older students develop positive attitudes towards lessons through portfolio application is their wish to make more quality products and it is thought that portfolio applications promote this situation.

## 5. Conclusions

In the study, it was found that the attitudes of pre-service teachers in Experimental Group 1, where portfolio was used, and pre-service teachers in Experimental Group 2, where both portfolio and lesson plan suitable for learning styles were used, towards biology were more positive than the attitudes of pre-service teachers in control group, where traditional method was continued. As predicted by Kolb's experiential learning theory, within the scope of the results obtained from the present study, it is recommended to use portfolio for other courses in the field of science to ensure that pre-service teachers have positive attitudes towards biology and for effective learning to take place.

## References

Anderson L. W. (1988). Attitudes and their measurement. J.P. Keeves (Ed.), Educational research, methodology and measurement: An international handbook. New York: Pergamon Press.

Aşkar, P. V. & Akkoyunlu, B. (1993). Kolb öğrenme stili envanteri. Eğitim ve Bilim, 87 (17), 37- 47.

Atasoy, B. (2002). Fen Öğrenimi ve Öğretimi, Ankara: Gündüz Eğitim ve Yayıncılık.

Avan, Y. & Şahin, S. (2020). Akran koçluğu ve portfolyo kullanımı: etkili öğretim denetiminde iki yöntem. Uluslararası Toplum Araştırmaları Dergisi, 16(28).

Bahçeci, D. & Kuru, M. (2006). Portfolyo değerlendirmenin insan iskelet sistemi konusunda öğrenci akademik başarısı üzerine etkisi. Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi (KEFAD). (7) 2, 145-162.

Baki, A. & Birgin, O. (2004). Alternatif değerlendirme aracı olarak bilgisayar destekli bireysel gelişim dosyası uygulamasından yansımalar: Bir özel durum çalışması. Turkish Online Journal of Educational Technology, 3(3), 79- 99.

Bedir, A., Polat, M. & Sakacı, T. (2009). İlköğretim 7.sınıf fen ve teknoloji dersine ait bir uygulama çalışması: Portfolyo. Celal Bayar Üniversitesi Fen Bilimleri Dergisi, 5(1), 45-58.

Belanoff, P. & Dickson, M. (Eds.). (1991). Portfolios: Process and product. Portsmouth, NH: Boynton/ Cook.

Bilgin, İ. & Bahar, M. (2015). Öğretmen adaylarının öğrenme stilleri ve fen bilgisi dersine karşı tutumları arasındaki ilişki. Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi, 2 (2), 53-67.

Bradbeer, J. (1999). Barriers to interdisciplinarity: disciplinary discourses and student learning. Journal of Geography in Higher Education, 23 (3), 381-396.

Campbell, D. T. & Stanley, J. C. (1963). Experimental and Quasiexperimental Design for Research on Teaching, N.L. Gage (Ed), Chicago: Rand, McNally.

Chang, C. (2001). A study on the evaluation and effectiveness analysis of web-based learning portfolio (WBLP). British Journal of Educational Technology, 32 (4), 435-458.

Ching Chun, S. & Julia, G. (2001). Web-based learning: Relationships among student motivation, attitude, learning styles and achievement. Journal of Agricultural Education, 42 (4), 12–20.

Christou, N. & Dinov, D. I. (2010). A study of students' learning styles. discipline attitudes and knowledge acquisition in technology-enhanced probability and statistics education. Journal of online learning and teaching. MERLOT. 6(3). 1-42

Çakır, Ö.S., Berberoğlu, G., Alpsan, D. & Uysal, C. (2002). Örnek olaya dayalı öğrenme yönteminin, cinsiyetin ve öğrenme stillerinin öğrencilerin performanslarına, biyoloji dersine karşı tutumlarına, akademik bilgilerine ve üst düzey düşünme yeteneklerine etkisi. V. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi, Bildiriler Kitabı

Çalışkan, H. & Kılınç, G. (2012). The relationship between the learning styles of students and their attitudes towards social studies course. Procedia-Social and Behavioral Sciences. 55. 47-56

Demirkan, S. (2019). Eğitim yönetiminde alternatif denetim yaklaşımı, öğretmen portfolyosu değerlendirme: Bir literatür taraması. Karamanoğlu Mehmetbey Uluslararası Eğitim Araştırmaları Dergisi 1(1), 49-62.

Dunn, R. & Dunn, K. (1993). Teaching Secondary School Students Through TheirIndividual Learning Styles: Practical Approaches for Grades 7-12, Boston, Mass.: Allyn& Bacon.

Dyne, P.L., Strauss, R.W. & Rinnert, S. (2002). Systems-based pratice: the sixth core competency. Academıc Emergency Medicine, 9 (11), 1270-1277

Ekici, G. (2002). Gregorc öğrenme stili ölçeği. Eğitim ve Bilim, 123, 42–47.

Fadlelmula-Kayan, F. (2015). Pre-service teachers' learning styles and attitudes toward teaching profession. Turkish Journal of Teacher Education. 4(1). 18-29.

Gencel Evin, İ. (2007). Kolb'un deneyimsel öğrenme kuramına dayalı öğrenme stilleri envanterinin Türkçeye uyarlama çalışması. Dokuz Eylül Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 9 (2), 120-139.

İnce, E. (2007). İlköğretim 6. Sınıf Öğrencilerinin Fen ve Teknoloji Dersine Karşı Olumlu Tutum Geliştirmelerinde ve Sınav Kaygısının Giderilmesinde Portfolyo Tekniğinin Etkisi. Yüksek Lisans Tezi, Gazi Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara.

Karadeniz-Bayrak, B. (2014). A research on students' learning styles and their attitudes toward science and technology. Journal of Theoretical Educational Science. 7(1). 1-15

Karagöz Bolat, N. (2007). İlköğretim 6. ve 7. Sınıf Fen ve Teknoloji Bilgisi Dersi Öğrencilerinin Öğrenme Stillerine Göre Motivasyon Başarı Düzeyleri. Yüksek Lisans Tezi, Osmangazi Üniversitesi, Fen Bilimleri Enstitüsü, Eskişehir.

Karasar, N. (2006). Bilimsel Araştırma Yöntemi; Kavramlar, İlkeler, Teknikler, 16.Baskı, Ankara: Nobel Yayın Dağıtım.

Kiriş-Avaroğılları, A. & Şaman, B. (2020). Sosyal bilgiler öğretmen adaylarının öğrenme stilleri ile eleştirel düşünme eğilimleri arasındaki ilişkinin incelenmesi, Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi, 53(411-434)

Koç, Erdamar,G. & Bangir Alpan, G.(2017). Ortaöğretim öğretmenlerinin öğrenme stilleri ve eleştirel düşünme eğilimlerinin karşılaştırılması, Gazi Eğitim Fakültesi Dergisi, 37(1), 93 -117.

Kolb, D. A. (1984). Experientiallearning: Experience as the Source of Learning and Development, New Jersay: Prentice Hall, Englewood Cliffs.

Kolb, D. A. (1999). The Kolb Learning Style Inventory, Hay Resources Direct, 6-25.

Köseoğlu, P. (2009). Biyoloji öğretmen adaylarının öğrenme stilleri ile biyoloji öğrenimlerine yönelik tutumları arasındaki ilişki. I. Uluslararası Eğitim Araştırmaları Kongresi. 1-3 Mayıs 2009, Çanakkale

Kutluca, A.Y., Yılmaz, A. & İbiş, E. (2018). Öğretmen adaylarının eleştirel düşünme tutumlarının çeşitli değişkenler açısından incelenmesi. Kastamonu Eğitim Fakültesi Dergisi, 26(6), 2045-2055. doi:10.24106/kefdergi.2309

Leigh, J. (2011). A reflective assessment of my practice as a geography teacher in inclusive higher. Education British Journal of Educational Research, 1(2), 69-83.

Matthews, D. (2001). Effect of a curriculum containing creation stories on attitudes. American Teacher. 63(6), 404–09.

Matthews, D. B. (1996). An ınvestigation of learning styles and perceived academic achievement for high school students. The Clearing House, 69(4), 249-254.

Mıhladız, G. (2007). İlköğretim Fen Bilgisi Öğretiminde Portfolyo Uygulamasının Öğrencilerin Akademik Başarılarına ve Derse Yönelik Tutumlarına Etkisi. Yüksek Lisans Tezi, Muğla Üniversitesi, Fen Bilimleri Enstitüsü, Muğla.

Mutlu, M. & Aydoğdu, M. (2003). Fen bilgisi eğitiminde Kolb'un yaşantısal öğrenme yaklaşımı. Pamukkale Üniversitesi Eğitim Fakültesi Dergisi, 13 (1),15-29.

Odabaşı Çimer, S. (2011). The effect of portfolio on students' learning: Student teachers' views. European Journal of Teacher Education, 34 (2), 161-176.

Okan, N. (2005). İlköğretim 7. Sınıf Fen Bilgisi Dersindeki Portfolyo Uygulamasının Değerlendirilmesi. Yüksek Lisans Tezi, Ankara Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara.

Orhan, A. T. (2007). Fen Eğitiminde Alternatif Ölçme ve Değerlendirme Yöntemlerinin İlköğretim Öğretmen Adayı, Öğretmen ve Öğrenci Boyutu Dikkate Alınarak İncelenmesi. Doktora Tezi, Gazi Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara.

Özgen, K. & Alkan, H. (2104). Yapılandırmacı öğrenme yaklaşımı kapsamında, öğrencilerin öğrenme stillerine uygun öğrenme etkinliklerinin akademik başarı ve tutuma etkileri: fonksiyon ve türev kavramı örneklemesi. Turkish Journal of Computer and Mathematics Education, 5 (1), 1-38.

Peker, M. & Aydın, B. (2003). Anadolu ve fen liselerindeki öğrencilerin öğrenme stilleri. Pamukkale Üniversitesi Eğitim Fakültesi Dergisi, 14 (2), 167-172.

Phillips, S. L. (2003). Contributing Factors to Music Attitude in Sixth, Seventh and Eighth Grade Students. Non-published Dissertation, Iowa.

Rees, C. (2004). Assessment undergraduate medical students' views about areflective portfolio assessment of their communication skills learning. Medical Education 38 (2) 125-128.

Sungur, S. & Tekkaya. C. (2003). Students' achievement in human circulatory system unit: the effects of reasoning ability and gender. Journal Of Science Education and Technology, 12 (1), 59–64.

Şaşmaz Ören, F., Karapınar, A., Sarı, K. ve Gürcan, F. (2021). Öğrencilerin gözünden portfolyo uygulaması: öz değerlendirme ve dosya kapak görseli̇ analizi. Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi,60, 408-440.

Tezci, E. & Dikici, A. (2002). "Oluşturmacı Uzaktan Öğrenmede Değerlendirme Yaklaşımları: Bir Dijital Portfolio Değerlendirme Örneği", Uluslararası Katılımlı Açık ve Uzaktan Eğitim Sempozyumu, Eskişehir, Anadolu Üniversitesi.

Tiwari, A. & C. Tang. (2003). From process to outcome: the effect of portfolio assessment on student learning. Nurse Education Today. 23 (4), 269-277.

Toptaş, B. (2017). A contemporary approach to performance evaluation: Teacher portfolios. Journal of Human Sciences, 14(4), 4155-4170.

Tuna, S. (2008). Resim iş eğitimi öğretmenliği öğrencilerinin öğrenme stilleri. Elektronik Sosyal Bilimler Dergisi, 7 (25), 252-261

Yapıcı, İ. Ü. & Hedevanlı, M. (2012). Biyoloji̇ öğretmen adaylarının öğrenme stilleri̇ ile biyoloji̇ öğretimine yönelik öz-yeterli̇k inançları arasındaki̇ ilişki. Elektronik Eğitim Bilimleri Dergisi. 1(1) 15-25

Yıldız A. M. (2016). Farklı yapıda hazırlanmış, iki öğrenme materyalinin farklı öğrenme stillerine sahip öğrencilerin akademik başarıları ve motivasyonlarına etkisi. Yayımlanmamış, yüksek lisans tezi. Çanakkale Onsekiz Mart Üniversitesi Eğitim Bilimleri Enstitüsü̈.

Zepeda, S. J. (2016). Insructional supervision: Applying tool s and concepts. (Çev. Edit. Apaydın C, Balcı, A). Ankara: Pegem Yayıncılık.

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