

Views of Pre-service Biology Teachers on Structured Grid*

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ABSTRACT

Research was carried out to identify pre-service biology teachers' views on 'structured grid', one of the alternative assessment and evaluation tools available to teachers. A questionnaire form, consisting of four open-ended questions, was used as a data collection tool. Changes were made to the questionnaire to take into account the opinions of two faculty members and two teachers. The sampling of the study consisted of 29 pre-service biology teachers enrolled on a teacher training course at the Education Faculty at Ordu University during the 2014-2015 academic year. A case study was utilized in the study. The data obtained were examined by means of inductive content analysis. Based on the findings obtained from the open-ended questionnaire, the pre-service biology teachers stated that the use of structured grid, one of the alternative assessment and evaluation tools, in a biology course would contribute towards improved learning of the subject and would have a positive effect on the identification and elimination of misconceptions. Moreover, it was found that it eliminated students' weaknesses, raised students' curiosity and facilitated teachers' work. It allowed subjects to be taught in a fun way, it enabled student participation and it provided learning retention. Moreover, the findings highlighted that teachers did not adequately use alternative assessment and evaluation tools that these activities were not included in the course books to a sufficient degree and that teachers wanted to use these activities. It was suggested at the end of the study that all the teachers working for the Ministry of National Education should be introduced to alternative assessment and evaluation tools and that they should also be given in-service training on how to use them and how to evaluate students with these tools. Another finding of the study revealed that pre-service teachers must acquire knowledge, skills and understanding of alternative assessment and evaluation tools and activities in their educational process.

Keywords: Pre-service teachers, Structured, Assessment and Evaluation

INTRODUCTION

In addition to determining whether education has attained its goals or objectives, one of the important factors contributing to students' development is the role played by assessment and evaluation activities (Çeçen, 2011). Measurement and evaluation is an important process, which evaluates students' learning and offers feedback to students (Büyükturan & Demirtaşlı, 2012). In teaching-learning processes, assessment and evaluation identify whether the instruction is successful or not, to what extent and for whom the instruction is successful or unsuccessful, who needs extra support and what precautions need to be taken to improve teaching (Turgut, 1992). Some of the purposes of assessment and evaluation, particularly



regarding students, teachers and instructional implementation, are as follows: to gather information about students and offer them a place in the education process; to reveal the difficulties, weaknesses and mistakes encountered in education by determining students' levels of learning; to evaluate the effectiveness of education; to guide students; and to determine the level of student performance (Bahar et al., 2009; Özdemir, 2010). The purpose of measurement and evaluation practices is not only to grade students or determine whether students pass or fail a course, but also to reveal students' skills considering their individual differences, to guide them considering their interests, needs and skills, to try to correct them and to prove the quality of the given education (Özdemir, 2010). In order to realize this purpose, alternative assessment and evaluation tools can be utilized. Alternative assessment and evaluation focus on how students construct their knowledge instead of their level of knowledge or performance and it also emphasizes their strengths instead of weaknesses (Ören Şaşmaz, 2014).

One of the alternative assessment and evaluation tools used by teachers is called 'structured grid'. The purpose of using this assessment tool is to identify students' level of knowledge, weaknesses and misconceptions. This assessment tool is formed of rows and columns in a way that creates boxes. A table consists of nine, 12 and 16 boxes depending on the level of the students and each box in the table is given a number. When creating a structured grid, a teacher prepares the first question about the subject and puts possible answers and the correct answer randomly in the boxes. The teacher then prepares the second question and possible answers are randomly distributed in the boxes. Some of the boxes containing the answers for the second question can be related to the first question. Students are asked to mark the correct boxes and put them in the correct logical and functional order. The students' responses reveal their level of knowledge, lack of knowledge, conceptual connections or misconceptions (Ünal, 2014). Therefore, structured grid offers an opportunity to determine the weaknesses and strengths of the cognitive structure existing in the students' minds (Hassan, Hill & Reid, 2004; Eroğlu & Kelecioğlu, 2011). The most important feature of the structured grid is that the boxes do not contain only one correct answer and the answers given in each box may be related to at least one question. As the students do not know the number of boxes for each question, they cannot reach the answer by chance. The wrong boxes selected by students reveal the misconceptions in their minds and the correct boxes identify the knowledge they have learned (Eroğlu & Kelecioğlu, 2011).

When science education national and international literature was reviewed, it was found that the studies on structured grid as an alternative assessment and evaluation tool in education began with Egan (1972) and it has been used successfully by many researchers since then (MacGuire & Johnstone, 1987; Neukom, 2000; Bahar, 2003; Durmuş & Karakırık, 2005; Karahan, 2007; Zimbicki, 2007; Bekiroğlu Ogan, 2008; Bahar et al., 2009; Tatar & Ören, 2009; Metin & Özmen, 2010; Eroğlu & Kelecioğlu, 2011; Vurkaya & Kırıkkaya, 2011; Büyükturan & Demirtaşlı, 2013; Özenç, 2013; Bektaş, 2014; Harman, 2014).

Büyükturan & Demirtaşlı (2013) in their study compared multiple choice test and structured grid, which were developed to assess the same behaviours regarding their psychometric properties. The findings obtained from the research revealed that the items of structured grid were much easier than the multiple choice items and the measurements obtained from the structured grid test were more reliable than the measurements obtained from the multiple choice test, but that there was no significant difference between the measurement reliability of the two tests. Özdemir (2010) examined the competencies of the pre-service teachers working in the primary schools towards alternative assessment and evaluation tools and their needs for in-service training. The findings obtained from the research study showed that, while the alternative assessment and evaluation tools that teachers felt most competent with were observation, performance tasks/homework, self-

evaluation and presentation, the tools with which they felt less competent were structured grid, diagnostic branched tree, rubric (sum of the scores in a range of criteria) and attitude scales. At the end of the study, teachers stated that they needed in-service training on the tools with which they felt less competent. On the other hand, while Vurkaya & Kırıkkaya (2011) in their study taught students in the experimental group on the 'electricity in our life' unit in the science and technology course using structured grid and diagnostic branched tree activities, the control group did not receive any intervention. It was found at the end of the study that there was a significant difference between the students' academic achievement and their attitudes towards the science and technology course, in favour of the experimental group. Metin & Özmen (2010) in their study informed a total of 25 third-year students studying in the primary school teaching programme about how to develop teaching materials such as mind maps, concept maps and structured grid and at the end of the study they determined that these activities developed students' critical thinking skills. Karahan (2007) tried to determine the effects of alternative assessment and evaluation techniques on achievement in his study by using a structured grid, a conceptual map and a diagnostic branched tree. At the end of the study, it was found that alternative assessment and evaluation affected students' achievement positively. Eroğlu & Kelecioğlu (2011) in their study determined that structured grid was a reliable assessment tool. Arıbaş & Göktaş (2014) revealed as a result of the study carried out with mathematics teachers that mathematics teachers did not have adequate knowledge about alternative assessment and evaluation and they needed in-service training. İzci, Göktaş & Şad(2014) in their study examined pre-service teachers views about alternative assessment and evaluation with regard to some variables. As a result of their study, they found that although pre-service teachers had some limitations about alternative assessment and evaluation, it had a positive effect on learning and teaching process. Sağlam-Arslan, Devicioğlu-Kaymakçı & Arslan (2009) in their study explored how much teachers used alternative assessment and evaluation and the problems teachers encountered in this process. at the end of the study it was found that in addition to lack of opportunities provided by the school, because teachers did not have enough information about these methods, they had a negative effect on the effective use of alternative assessment and evaluation methods. Moreover, it is suggested that besides offering teachers theoretical information related to alternative assessment and evaluation, they should be given additional pedagogical formation including practical knowledge. Kuran & Kanatlı (2009) in their study tried to determine elementary teachers' views about alternative assessment and evaluation techniques, frequency of using these techniques and the problems they encountered while using these techniques. They found at the end of the study that teachers had problems about using alternative assessment and evaluation techniques and the reasons for this problem was found to be time, lack of sources, crowded classrooms, lack of parent and student interest, and teachers' lack of knowledge about alternative assessment and evaluation techniques.

In addition, when the national literature was reviewed, it was found that teachers and pre-service teachers in our country did not have adequate knowledge and skills about structured grid (Acat & Demir, 2007; Çalık, 2007; Doğan, Karakaya & Gelbal, 2007; Gelbal & Kelecioğlu, 2007; Karahan, 2007; Atikol, 2008; Tatar & Ören, 2009; Özdemir, 2010; Özenç, 2013). Therefore, this study was carried out to eliminate the weaknesses mentioned above, to have pre-service teachers gain the required knowledge and skills and to determine their views about these activities.

This research was carried out to identify pre-service biology teachers' views on structured grid. The study sought answers to the following questions given below:

1. What are the pre-service biology teachers' views about the use of structured grid, one of the alternative assessment and evaluation activities?

2. What are the pre-service biology teachers' views about their practice teachers using structured grid in their lessons in the schools they visited within the context of their teaching practice?
3. What are the pre-service biology teachers' views about the extent to which structured grid is included in biology course books?
4. What are the pre-service biology teachers' views and suggestions about the use of structured grid?

METHODS

a) Methodology of Research

A case study was used in this research. Case study is conducted in a natural environment such as a classroom, or an organization, aiming to produce a holistic interpretation of the environment or situations (Yıldırım & Şimşek, 2005). The research involves in-depth and detailed examination of a problem in a short time. The most important advantage of this method is that it gives the opportunity to focus on an instance of a problem (Çepni, 2007). This research emphasizes an instance of a class of phenomena and offers an opportunity to use different data collection tools together (Cohen & Manion, 1994).

b) Sample of Research

The sampling of this study consisted of 29 pre-service biology teachers enrolled on a teacher training course at the Faculty of Education at Ordu University in the 2014-2015 academic year. The study was carried out in the special teaching methods course. This is a four-hour course per week (two hours theoretical and two hours practice). The researcher explained and demonstrated alternative assessment and evaluation activities during the theoretical course hours. During the practice hours, the pre-service teachers performed these activities. The mistakes made by the pre-service teachers were corrected and the activities were reinforced.

c) Data Collection Tools

The questionnaire, consisting of open-ended questions, was used in the study as a data collection tool. The open-ended questionnaire was developed to identify pre-service teachers' views on structured grid. The validity of qualitative researches can be obtained through expert opinions, participant approval; whereas the reliability is ensured through a study of consistency and confirmation (Yıldırım & Şimşek, 2005). The first draft questions of the data collection tool, consisting of six questions, were composed by reviewing the relevant literature and necessary corrections were made taking into account the views of the two faculty members and two science and technology teachers who were experts in their fields. Considering these corrections, the number of questions was reduced to four. Two students in the implementation read these questions and it was determined that the questions were clear and understandable. It was verified by various experts in their field that these questions were suitable for the purpose of the study and they agreed that 25 minutes on average would be enough for the implementation. It was therefore approved that the time allocated for the questions would be 25 minutes. As the questions were explained in the findings section, they are not presented here.

d) Data Analysis

The open-ended questionnaires were distributed to the 29 pre-service teachers. The data obtained from the questions were analysed using content analysis. The researcher examined the data obtained from the teachers and created themes and codes. Based on the themes and codes, the frequency and percentages of each opinion were found. Necessary explanations and interpretations related to the pre-service teachers' views are presented below the tables.

FINDINGS

This research was carried out to identify pre-service biology teachers' views on structured grid. The findings obtained for each question asked to the teachers were presented in tables. Necessary interpretations were made below each table.

Question 1: The responses of the pre-service teachers to the question '*What are your view about the use of structured grid, one of the alternative assessment and evaluation activities?*' are presented in Table 1.

Table 1. *The Analysis Results of the Pre-service Biology Teachers' Responses to Question 1*

Theme	Code	Frequency	Percentage
Using structured grid in assessment and evaluation	It promotes improved learning of the subject	19	43
Positive Views	It identifies misconceptions	5	11
	It removes students' weaknesses	5	11
	It identifies students' weaknesses	5	11
	It fosters active participation of students	3	9
	It raises student curiosity	1	2
	It removes misconceptions	2	5
	It facilitates teachers' work	1	2
Negative Views	It was confusing for students	1	2
	It is difficult to evaluate it	1	2
	Its evaluation is disadvantageous for students	1	2

When Table 1 was examined, it was determined that the pre-service biology teachers had both negative and positive views about using structured grid activities. The results show that 94% of the students expressed positive views and 6% stated negative views. The following are some of the positive views stated by the pre-service teachers about using the activities: promoting better learning (43%), identifying misconceptions (11%), identifying students' weaknesses (11%), removing students' weaknesses (11%), raising curiosity of students (2%), eliminating misconceptions (5%) and facilitating teacher's work (2%). The following negative views were stated by the pre-service teachers: confusing for students (2%), difficult to evaluate (2%) and disadvantageous evaluation for students.

Question 2: The responses of the pre-service teachers to the question "*Do the practice teachers use structured grid in their lessons in the schools you visited within the context of teaching practice? How do you evaluate it?*" are presented in Table 2.

Table 2. *The Analysis Results of the Pre-service Biology Teachers' Responses to Question 2*

Theme	Code	Frequency	Percentage
Its use by the practice teacher in the lesson	Yes	12	41
	No	16	55
	Sometimes	1	4
The views related to the teachers who stated that it was used in the lesson	It has benefits in education	3	17
	The subject becomes more enjoyable	2	11
	The students participate in the lesson	1	6
	Teaching is effective and efficient	1	6
	It promotes permanent learning	1	6
	The subject taught is understood better and more clearly	1	6
	Students' weaknesses are eliminated	1	6
The views related to the teachers who stated that it was not used in the lesson	If it were used, concepts would be understood much better	1	6
	If it were used, students' weaknesses would be eliminated	1	6
	If it were used, students would revise the subject	2	11
	If it were used, students would actively participate in the lesson	1	6
	Students do not comprehend the subject	1	6
	It provides a very simple explanation	1	6
	It presents the subject better	1	6

When the data in Table 2 were examined, it was found that 41% of the guide teachers used structured grid in their lessons, 55% of them did not use it and 4% of them sometimes used it. The pre-service teachers who stated that the guide teachers used structured grid in their lessons stated that structured grid was effective in teaching the courses (17%), the subjects were taught in a more fun way (11%), it enabled students to participate in the lessons (6%), the instruction was efficient (6%), the subject was understood better and more clearly (6%), it removed students' weaknesses (6%) and it promoted permanent learning (6%). The pre-service teachers who stated that the guide teacher did not use structured grid in his/her lessons stated that, if it were used, the concepts would be understood better (6%), students' weaknesses would be eliminated (6%), it would allow students to revise their lessons (11%) and it would offer opportunities for student participation in the lesson (6%). They also mentioned that the students were not able to comprehend the subject (6%), a simple explanation was provided (6%) and the subject was presented better.

Question 3: The responses of the pre-service teachers to the question "Do the biology course books involve structured grid? How do you evaluate it?" are presented in Table 3.

Table 3. *The Analysis Results of the Pre-service Biology Teachers' Responses to Question 3*

Theme	Code	Frequency	Percentage
Its inclusion in the course books	Yes	26	90
	Very little	1	3
	Not enough	2	7
Students' state of evaluation Positive	It fosters active participation in the lesson	1	3
	It should always be used in education	2	7
	It facilitates learning	7	24
	It removes weaknesses	4	14
	It reinforces concepts	4	14
	It makes a difference	2	7
	It identifies the levels	1	3
	It promotes thinking	2	7
	It draws attention	1	3
	Negative	There are only a few at the end of the units	3

When Table 3 was examined, 90% of the pre-service teachers stated that structured grid activities were included in the biology course book, 3% of them said that it covered very few activities and 7% of them said that there were not enough of the activities in the biology course book. Moreover, the pre-service teachers stated that the inclusion of structured grid in the course books had many benefits, such as promoting student participation in the lesson (3%), facilitating learning (24%), removing weaknesses (14%), reinforcing concepts (14%), making a difference (7%), promoting thinking (7%), drawing attention (3%), determining the level (3%) and should always be used in education (3%). In addition, 10% of the students stated that there were not enough structured grid activities and that they were only included at the end of the units.

Question 4. The responses of the pre-service teachers to the question “*Would you like to use a structured grid, an alternative assessment and evaluation tool? Explain your reason.*” are presented in Table 4.

Table 4. *The Analysis Results of the Pre-service Biology Teachers' Responses to Question 4*

Theme	Code	Frequency	Percentage
Desire to use structured grid	I would like to use it	26	90
	I do not want to use it	3	10
Positive views	It helps the subject to be understood	11	29
	It promotes participation in the lesson	7	18
	It enables the identification of weaknesses	5	13
	It enables the removal of weaknesses	2	5
	It promotes retention	3	8
	It promotes the teaching of concepts	1	3
	It raises curiosity	2	5
	It enables reinforcement	1	3
Negative views	It is difficult to assess	2	5
	It is confusing	4	10

Regarding the findings obtained from the data analysis in Table 4, 90% of the pre-service biology teachers stated that they wanted to use structured grid in their lessons but 10% of them did not want to use it. In addition, the pre-service teachers stated that it enabled the subject to be understood (29%), it promoted student participation in the lesson (18%), it identified weaknesses (13%), it eliminated weaknesses (5%), it promoted knowledge retention (8%), it promoted learning of the concepts (3%), it raised student curiosity (5%) and it reinforced the subjects (3%). The pre-service teachers who expressed negative views remarked that it was difficult to assess structured grid (5%) and it was confusing (10%).

DISCUSSION

Assessment and evaluation in a constructivist curriculum must be a process that will consider students' individual differences and evaluate them in a multi-dimensional way. Moreover, it must be a process that will allow for the implementation of assessment and evaluation tools that will offer opportunities to students to use the knowledge, skills, attitudes, values and understanding that they have acquired during the learning process in their daily life. Therefore, it is expected that teachers who are the practitioners of the curriculum must acquire correct and sufficient information, skills and understanding about the constructivist approach to assessment and evaluation and alternative assessment and evaluation tools (Büyükturan & Demirtaşlı, 2012). One of these alternative assessment and evaluation tools is structured grid.

Structured grid is effective in identifying students' levels of knowledge, weaknesses and misconceptions and eliminating those misconceptions (Ünal, 2014). When national literature was reviewed, it was found that teachers and pre-service teachers in our country did not have enough information and skills about structured grid (Acat & Demir, 2007; Çalık, 2007; Doğan, Karakaya & Gelbal, 2007; Gelbal & Kelecioğlu, 2007; Karahan, 2007; Atikol, 2008; Kazu, Pullu & Demiralp'in, 2008; Tatar & Ören, 2009; Özdemir, 2010; Özenç, 2013). Thus, this study aims to eliminate this weakness, to enable teachers to acquire the necessary knowledge and skills and to determine their views about structured grid activities. Based on the findings obtained from the open-ended questionnaire, the pre-service biology teachers stated that the use of structured grid, one of the alternative assessment and evaluation tools, in a biology course would contribute towards improved learning of the subject and would have a positive effect on the identification and elimination of misconceptions. Karahan (2007) it was found that alternative assessment and evaluation affected students' achievement positively, While Eroğlu & Kelecioğlu (2011) in their study determined that structured grid was a reliable assessment tool. Moreover, it was found that it eliminated students' weaknesses, raised students' curiosity and facilitated teachers' work. It allowed subjects to be taught in a fun way, it enabled student participation and it provided learning retention. İzci, Göktaş & Şad(2014) determined that pre-service teachers supported alternative assessment and evaluation learning and teaching process positively. *Moreover*, the findings highlighted that teachers did not adequately use alternative assessment and evaluation tools that these activities were not included in the course books to a sufficient degree and that teachers wanted to use these activities. Özdemir (2010) stated that the alternative assessment and evaluation tools considered least effective by the teachers were structured grid, diagnostic branched tree, rubric (sum of the scores in a range of criteria) and attitude scales and added that they needed in-service training in these areas. Moreover, Okur (2008) stated in a study that the least-known alternative assessment and evaluation tools by the teachers were structured grid and diagnostic branched tree and determined that the teachers should be offered in-service training about these alternative assessment and evaluation tools. Arbaş & Göktaş (2014) found that mathematics teachers did not have enough knowledge about alternative

assessment and evaluation techniques and they required in-service training about this topic. Sağlam arslan, Devecioğlu-Kaymakçı & Arslan (2009) revealed that because teachers did not have enough knowledge about alternative assessment and evaluation techniques they should be given both theoretical knowledge about knowledge about alternative assessment and evaluation methods and additional pedagogical formation involving practical knowledge. In addition, Kuran & Kanatlı (2009) identified that teachers had problems about using knowledge about alternative assessment and evaluation techniques..In addition, in the studies conducted by Acat & Demir, 2007; Çalık, 2007; Doğan, Karakaya & Gelbal, 2007; Gelbal & Kelecioğlu, 2007; Atikol, 2008), teachers stated that they did not feel themselves qualified regarding alternative assessment and evaluation tools. The studies conducted by Kuzu, Pullu & Demiralp'in (2008) revealed that 60% of the teachers did not know in detail the assessment and evaluation tools that were included in the new primary education curriculum (as cited in Özdemir, 2010).

CONCLUSION and RECOMMENDATIONS

Regarding the data obtained at the end of the research, it was concluded that using structured grid contributed towards pre-service biology teachers better understanding of the subject, it had positive effects on eliminating misconceptions after determining them, it removed students' weaknesses, it raised student curiosity, it facilitated teachers' work, the subjects were taught and learned in a fun way and it promoted student participation and permanent learning. Moreover, the pre-service teachers' statements led us to conclude that these alternative assessment and evaluation activities were not used adequately by their guide teachers, the activities were not sufficiently included in the course books and the teachers wanted to use these activities. The results obtained from this study are compatible with the research results of Metin & Özmen 2010; Eroğlu & Kelecioğlu, 2011; Vurkaya & Kırıkkaya, 2011; Büyükturan & Demirtaşlı, 2013; Özenç, 2013; Bektaş, 2014).

Considering these results, all of the teachers working for the Ministry of National Education must be given in-service training seminars to introduce alternative assessment and evaluation tools, how to use them and how to evaluate students by using these tools. Neukom (2000) determined in a study that the achievement obtained from alternative assessment and evaluation techniques was dependent on both teachers and students and that teachers in particular must be given in-service training before using such techniques (as cited in Şenel et al., 2009). Moreover, Zimbicki (2007) revealed that teachers should be trained properly for the desired efficiency and that they would gain knowledge with the support they were given (as cited in Şenel et al., 2009). In addition to this, pre-service teachers must gain knowledge, skills and understanding of alternative assessment and evaluation tools and activities during their education. In order to achieve this, special teaching methods and assessment and evaluation courses taken by the students in their undergraduate studies must be taught by qualified and well-equipped instructors in this field. Moreover, practice instructors and practice teachers must guide pre-service teachers about alternative assessment and evaluation tools within the context of teaching practices and they must help pre-service teachers to develop in this area. Finally, structured grid, an alternative assessment and evaluation tool, must be given more prominence in the course books of the Ministry of National Education.

The following recommendations can be made regarding the study:

1. Students' views about structured grid should be investigated.
2. Pre-service teachers' views studying in different majors should be examined.
3. Teachers' views about structured grid should be investigated.

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