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TESTING THE LEARNING OUTCOMES OF WOOD TECHNOLOGY COURSE

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ABSTRACT

In this study, realization level of learning outcomes is examined within the context of a pilot course. Purpose of this study is to test learning outcomes of the pilot course which are determined by instructor. For this purpose, "Wood Technology" course, which has been taught at Department of Wood Science and Furniture Design and Department of Woodworking Industrial Engineering, is chosen as a pilot course. The course consists of 12 units. Learning outcomes of each unit are prepared by the instructor. To test realization level of learning outcomes, two different questionnaire were prepared and applied to students who had taken the course in the period when study was conducted. One of the questionnaire was to determine „students' expectation" from each course unit before teaching. The other questionnaire was to determine „achieved level" at the end of each course unit. To check the validity of achieved level, a quiz was given at the end of each course unit. In addition, another questionnaire was applied to determine level of „achieved learning outcomes" of graduated students. All data were analyzed statistically and results were compared by t tests. As a result of statistical analyses, it was determined that students underestimated their learning outcomes by 105 %; i.e.; they learned two times more than their expectation. In general, it can be concluded that determination and testing learning outcomes in a course is necessary in order to achieve a better learning-teaching balance.

Key words: Learning outcomes, National Qualification Framework For Higher Education, Wood Technology Course

1. INTRODUCTION

In June 1999, representatives of the Ministers of Education of 29 European countries convened in Bologna, Italy to formulate the Bologna Declaration, aimed at establishing a common European Higher Education Area (EHEA) (Adam, 2004, 2006).

The Bologna Process, starting officially with the participation of 29 countries in 1999 has reached 47 countries in 2010 and the process has become widely efficient across Europe.

The overarching aim of the Bologna Process was to create a European Higher Education Area (EHEA) which was launched in 2010, that promotes mobility; attracts students and staff from Europe as well as from other parts of the world; It is ongoing process which aims to do this by facilitating greater comparability and compatibility between the diverse higher education systems an institutions across Europe and by enhancing their quality.

The various ministerial meetings since 1999 have broadened this agenda and have given greater precision to the tools that have been developed. The undergraduate/postgraduate degree structure has been modified into a three-cycle system, which now includes the concept of qualifications frameworks, with an emphasis on learning outcomes (Anonymous, 2012).

In the Leuven Communiqué of 2009, the Ministers identified these priorities for the coming decade (Anonymous, 2012):

- social dimension: equitable access and completion;
- lifelong learning;
- employability;
- student-centred learning and the teaching mission of higher education,
- education, research and innovation;
- international openness;
- mobility;
- data collection;
- multidimensional transparency tools,
- funding.

The Bologna process spells out a number of "action lines" in which learning outcomes should play an important role (Adam, 2004, 2006).

According to Adam (2006), learning outcomes are statements of what a learner is expected to know, understand and/or be able to demonstrate at the end of a period of learning. They are explicit statements about the outcomes of learning - the results of learning. They are usually defined in terms of a mixture of knowledge, skills, abilities, attitudes and understanding that an individual will attain as a result of his or her successful engagement in a particular set of higher education experiences. In reality, they represent much more than this. They exemplify a particular methodological approach for the expression and description of the curriculum (modules, units and qualifications) and levels, cycles, subject benchmark statements and the 'new style' Bologna qualifications frameworks.

A survey of the literature on learning outcomes shows similar definitions:

- Learning outcomes are statements of what is expected that the student will be able to do as a result of learning the activity. (Jenkins and Unwin, 2001);
- Learning outcomes are an explicit description of what a learner should know, understand and be able to do as a result of learning. (Bingham, 1999);
- Learning outcomes are statements of what a learner is expected to know, understand and/or be able to demonstrate after completion of a process of learning. (ECTS Users' Guide, 2005);
- Learning outcome: a statement of what a learner is expected to know, understand and/or be able to demonstrate at the end of a period of learning. (Gosling and Moon, 2001);
- A learning outcome is a statement of what the learner is expected to know, understand and/or be able to do at the end of a period of learning. (Donnelly and Fitzmaurice, 2005);
- A learning outcome is a statement of what a learner is expected to know, understand and be able to do at the end of a period of learning and of how that learning is to be demonstrated. (Moon, 2002);
- A learning outcome is a written statement of what the successful student/learner is expected to be able to do at the end of the module/course unit or qualification. (Adam, 2004).

The traditional way of designing modules and programs was to start from the content of the course. Teachers decided on the content that they intended to teach, planned how to teach this content and then assessed the content. This type of approach focused on the teacher's input and on assessment in terms of how well the students absorbed the material taught. Course descriptions referred mainly to the content of the course that would be covered in lectures. This approach

to teaching has been referred to as a teacher-centered approach. Among the criticisms of this type of approach in the literature (Gosling and Moon, 2001) is that it can be difficult to identify precisely what the student has to be able to do in order to pass the module or program. It is also points out the international trends in education show a shift from the traditional "teacher centered" approach to a "student centered" approach. This alternative model focuses on what the students are expected to be able to do at the end of the module or program. Hence, this approach is commonly referred to as an outcome-based approach. Statements called intended learning outcomes, commonly shortened to learning outcomes, are used to express what it is expected that students should be able to do at the end of the learning period.

To shift from "teacher centered" approach to a "student centered" approach in the area of wood science and technology education, learning outcomes of each program and course have to be defined according to the subject (field) qualifications and subsequently National Qualifications Framework.

In this study, it was aimed to test realization level of already determined learning outcomes of a chosen pilot course which is thought in wood science and technology education area. For this purpose:

- The pilot course which is used for the study;
- Teaching methods of the course;
- Expected realization level by instructor at end of the course;
- Before teaching, expected realization level by students at end of the course;
- Achieved level of learning outcomes at end of the course;
- Perceptive achieved level of learning outcomes of graduate's

are determined.

The study is completed in autumn and spring semesters of an academic year 2010-2011. During the study, totally 285 questionnaires and quizzes were applied to 60 students. Results of the questionnaires and quizzes were analyzed by simple statistical methods.

2. EXPERIMENTAL METHOD

As the pilot course, "Wood Technology I and Wood Technology II" courses were chosen which have been taught in Department of Wood Science and Furniture Design and Wood Products Industrial Engineering in Mugla University, Turkey. An interactive course material which is prepared by Department of Forest Products Management Development Institute in Minnesota University based on a book „Forest Products and Wood Science – An Introduction (3rd edition)" published by J.G Haygreen and J.L. Bowyer in 1996 (J.G Haygreen, J.L. Bowyer, 1996).

The teaching method was interactive presentation, question and answer, field trips and group homework.

The course consists 12 units. 6 units of those were taught in autumn semester as content of „Wood Technology I" course, and the other 6 units were taught in spring semester content of „Wood Technology II" course. Learning outcomes for both courses and for each unit, were determined by the instructor. To test the realization level of learning outcomes, three types of questionnaires were prepared. Following are the list of questionnaires:

Questionnaire 1: Students' expected realization level of learning outcomes;

Questionnaire 2: Students' achieved level of learning outcomes;

Questionnaire 3: Graduates' achieved level of learning outcomes.

Preparation and application of questionnaires

Following Likert scale was utilized in all questionnaires:

1. Very Good;
2. Good;
3. Neither Good or Bad;
4. Less;
5. Nary.

In Questionnaire 1 the aim was to determine students' expected realization level of learning outcomes. Therefore, students' answers were their expectations from the course. Thus, the questions were composed with statements of probability. For example; "I may draw structure of cell wall". The questionnaire was applied right after a short introduction to the course by the instructor. It was applied to totally 26 students who had attended the courses in both two semesters.

In Questionnaire 2, the aim was to determine students' achieved level of learning outcomes at the end of the unit. The answers were prepared in a way that they give exact statements such as „I can draw structure of cell wall". The questionnaire was applied right after the end of each course unit. Shortly after, a quiz which consists of related questions to the unit was applied to check validity of attested achieved level of learning outcomes.

In Questionnaire 3, the aim was to determine achieved level of learning outcomes of graduates who had taken the course in the past five years. For this purpose, contact information of graduates were found from student database of department and the questionnaire was delivered and provided to be filled by email. 34 graduated students provided feedback.

Evaluation of data

The questionnaires were evaluated by scoring which seen in table 2.1.

Table 2.1: Scoring Schedule

Level	Point
Very Good	4
Good	3
Neither Good or Bad	2
Less	1
Nary	0

As can be seen in the table 2.1, each level of response has a different point. The statistical analyzes were carried out based on the points. In this process, each question which was in the questionnaire had been averaged according to students' response.

Average point of each student was calculated according to the points given to each single unit. Average grade and standard deviation of each unit was calculated based on grades given by students. This process was applied to all units. It was analyzed a general result for all questionnaires based on results of the units. Instructors' expectations were also used in comparison. Since the learning outcomes of each unit and the course is originally prepared by the instructor, each graded statement was given the maximum point of 4 so as to describe instructor's expected learning outcome level.

To test realization level of learning outcomes, following comparisons were made:

- Results of questionnaire 2 vs instructor expectation (maximum level);
- Results of questionnaire 1vs questionnaire 2 for each unit;
- Results of questionnaire 2 vs quizzes for each unit;
- Results of questionnaire 2 vs questionnaire 3.

3. RESULTS AND DISCUSSION

In this section it was given results of statistical analyzes. It is seen results of all research section in table 3.1. The standard normal distributions were provided by the data that obtained from the results of each questionnaire. Therefore, the simple t tests were performed for comparing the results.

Table 3.1: Results of Statistical Analyzes

Unit	Expectation Level of Instructor	Expectation Level of Students	Achieved Level End of The Study	Quizzes	Achieved Level of Graduate Students
					Autumn Semester
Unit 1	4	1,63	2,84	3,53	
Unit 2	4	1,40	3,24	3.53	
Unit 3	4	1,54	2,80	3,7	**2,73**
Unit 4	4	1,32	3,01	3,63	
Unit 5	4	1,41	3,16	3,86	
Unit 6	4	1,18	3,53	3,21	
	4	**1,41**	**3,09**	**3,57**	Spring Semester
Unit 7	4	1,98	2,85	2,97	
Unit 8	4	1,6	2,65	2,65	
Unit 9	4	1,54	2,71	3,31	
Unit 10	4	1,18	2,77	3,4	**2,88**
Unit 11	4	1,34	2,91	2,4	
Unit 12	4	0,95	2,45	2,3	
	4	**1,43**	**2,72**	**2,84**	
General overages	**4**	**1,42**	**2,91**	**3,2**	**2,81**

Although the average result of questionnaire 1 that defines student's expectation level was obtained as 1,42, average result of questionnaire 2 was 2,91 end of the course units. In addition, average result of quizzes which was applied to check validity of result of questionnaire 2 was 3,2. Both comparisons clearly proved that students underestimated their performance before the course and even after the course. The average result of questionnaire 3 which was applied to determine achieved level of graduates was 2,81. T-test results of expectation of instructor and students were given in Table 3.2.

Table 3.2: T-test result of expectation of instructor and students

Test Value = 4					
				% 95 Confidence Interval of the Difference	
t	df	Sig.	Mean Difference	Lower	Upper
-34,542	124	,000	-2,57364	-2,7211	-2,4262

As it is shown in Table 3.2, a meaningful difference between the expectations of instructor and students. It is deduced by this result, the students were not ready to learning activity or have not been convinced enough and motivated about course or course unit.

T-test result of the questionnaire 2 and instructor expectation level from student was given in table 3.3.

Table 3.3: T-test result of questionnaire 2 and instructor expectation

Test Value = 4					
				% 95 Confidence Interval of the Difference	
t	df	Sig.	Mean Difference	Lower	Upper
-17,889	125	,000	-1,08721	-1,2075	-,9669

Table 3.3 shows that there was a meaningful difference between achieved level of learning outcomes and learning outcomes defined by the instructor. This means that the achieved level did not fulfill the instructor's expectations. This result clearly indicates a need to revise the outcomes or add different activities to stimulate the learning activity.

T-test result of student's expectation level and achieved level of learning outcomes at end of the course was given in table 3.4.

Table 3.4: T test result of student expectation level and achieved level

t test for Equality of Means						
					% 95 Confidence Interval of the Difference	
t	df	sig	Mean Difference	Std. Error Difference	Lower	Upper
-15,472	249	,000	-1,48643	,09607	-1,67565	-1,29721
-15,459	238,961	,000	-1,48643	,09615	-1,67584	-1,29702

Results showed that there was a meaningful difference between students' expectation level and achieved level of learning outcomes at the end of each course unit. According to results, it could be concluded that students were gained more competence than they expected.

T-test result of achieved level of learning outcomes of current students and graduates were given in table 3.5.

Table 3.5: T-test result of achieved level of students and graduates

t test for Equality of Means						
					%95 Confidence Interval of the Difference	
t	df	sig	Mean Difference	Std. Error Difference	Lower	Upper
,733	158	,441	,09661	,12495	-,15017	,34340
,934	71,650	,354	,09661	,10349	-,10971	,30293

Table 3.5 shows that there was no meaningful difference between achieved level of learning outcomes of current students and graduates. Results confirm that the graduates consistently agree that they gained the competence level in the course even after being exposed to real work conditions. This result both verify the consistency of achieved level of learning outcomes and consistency of defined learning outcomes since it is tested in the work environment

4. CONCLUSIONS

In this study, realization level of learning outcomes of a pilot course was tested. For this purpose, 285 Questionnaires and quizzes were applied to 60 students. All data that were obtained from the research was analyzed and compared statistically. The

summarized results of analyses are given in Figure 4.1. at below.

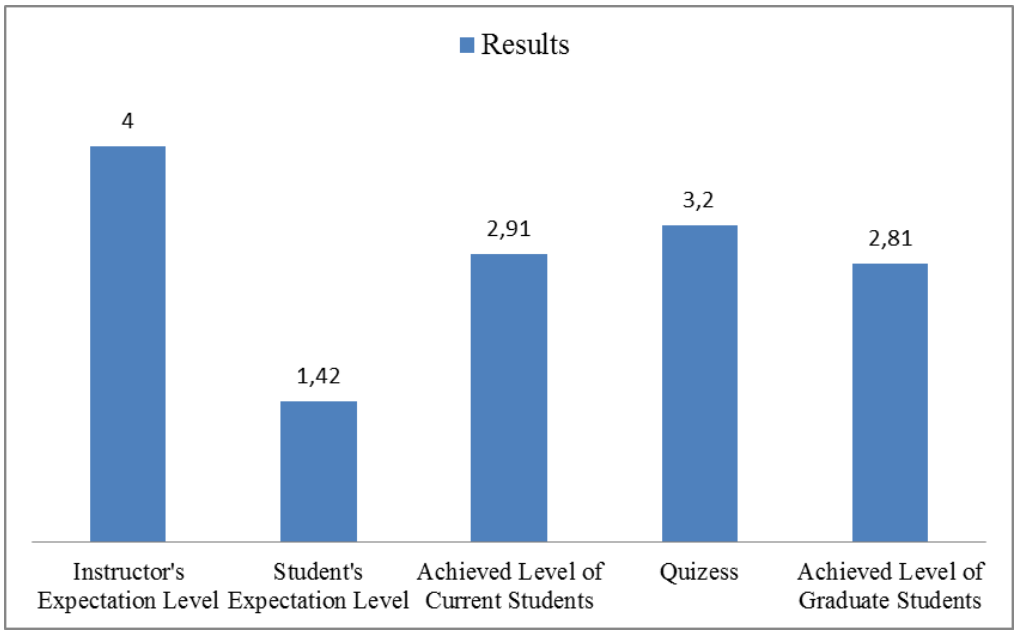

Figure 4.1: General results

Figure 3.1 shows that the instructor's expectation level of learning outcomes had been described as the maximum level. Students' expectation level was realized as 1,42. That is a value of between less and neither good or bad. But the achieved level of learning outcomes at the end of the course were realized as 2,91. This value is close to good level that is in scoring schedule and it can be said the learning outcomes of the course were realized at good level.

As a result of the study, course's learning outcomes were realized as 72,5 % in comparison with maximum level. The achieved level of learning outcomes were increased 105 % in comparison of students' expectation level. Result of quizzes which was realized as 3.2 verified the achieved level.

Learning outcomes are statements of what is expected that the student will be able to do as a result of learning the activity. (Jenkins and Unwin, 2001). In this manner, content and teaching process of the course are very important for education quality. By the study, we can conclude that it is possible to collect data for determination of learning outcomes, course contents and teaching processes which are necessary in order to achieve a better learning-teaching balance.

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