

# An Analysis of Turkish Pre-Service Physics Teachers' Discussions of Learning Objectives of Secondary School Physics Programme of Study

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## ABSTRACT

This study focuses on the perceptions of pre-service physics teachers about the learning objectives of the secondary school physics programme of study. Data were collected from pre-service physics teachers attending a compulsory course named Instructional Planning and Evaluation in Secondary Education. Pre-service teachers' online discussions as contributions to the preparation of an assignment for the course comprised the data for the study. Results showed that pre-service teachers had difficulty in identifying and deciding level according the Bloom's taxonomy of higher order learning objectives whereas they easily identified learning objectives from knowledge, comprehension and application levels. Keywords: physics programme, learning objectives, Bloom's hierarchical model

**Key words:** *community engagement, business executives, strategic planning, laddering technique, hierarchical value map*

## INTRODUCTION

The Turkish Secondary School Physics Programme of Study (PoS) has obvious differences compared to the previous ones, such as having a holistic design, the inclusion of new topics, and clearly stated learning objectives rather than a list of topics for each grade level (MEB, 2007). Clearly stated learning objectives are perhaps the most important difference which would directly influence the practice of teachers. Teachers' understanding of these is very important for the proper implementation of the programme of study. Obviously, pre-service teachers also have make sense of what these objectives are conveying. This paper focuses on pre-service teachers' understanding of learning objectives included in the Physics PoS. Misunderstood PoS may lead PSTs to utilize improper instructional methods, materials and media, which, in turn, may lead to learning difficulties and problems in other areas. This importance led us to investigate PSTs' perceptions about PoS. In this study, we have analysed the process with which PST get familiar with the learning objectives of the PoS.

The same learning objective might be perceived differently by different students and teachers, which would then affect their lessons (Taylor & Maguire, 1967). To minimise the number of misunderstood and/or unperceived objectives, a study to reveal PSTs' perceptions of and difficulties in understanding the learning objectives seems quite significant. Carré and Carter (1990) had prepared a nationwide survey in UK about teachers' perceptions to revise their core curriculum. Although curriculum developers in Turkey had done surveys too before the starting to write the curriculum; it was done to understand teachers' needs and suggestions. We do not have the knowledge of whether the learning objectives were perceived by the teachers as intended by the developers or not has been studied. Understanding PSTs' perceptions of the learning objectives is as important as understanding teachers' perceptions of the learning objectives, since we, as teacher educators, still have time to remedy any discrepancy in their perceptions and the intended learning objectives. (Berkheimer & Lott, 1984). Moreover, in-service teachers complain about their tight schedule, therefore not having enough time for scrutinizing the learning objectives (Tochon & Munby, 1993). Therefore, more chances can be given for PSTs to investigate the learning objectives in depth. Considering the fact that one of the compulsory courses in secondary science and mathematics education departments is to provide prospective teachers with the knowledge and skills related to curriculum and learning objectives, and the above

discussions, it is only reasonable to focus on pre-service teachers and reveal possible difficulties in their attempts to understand the learning objectives. For this reason, this study set out to answer the following research question: What are pre-service physics teachers' difficulties in analysing the learning objectives in secondary school physics programme of study?

## THE STUDY

Fourteen PSTs attending a compulsory course entitled Instructional Planning and Evaluation in Secondary Education in their 3rd year of study participated in the study. As part of the course requirements, they were assigned a task in which they were required to analyse the learning objectives in the Physics PoS. Four groups (of which 2 of them consisted of 4 PSTs and 2 of them consisted of 3 PSTs) were formed so that each grade level (9-12) was given to a different group. Groups were instructed to examine all the learning objectives for their grade level in order to identify the level as per Bloom's Taxonomy. Their examination of the learning objectives were based on Mager's ABCD format (Mager, 1962). In order for the course instructor and the teaching assistant to follow, contribute when necessary to the discussions, PSTs were asked to use Google Groups as the medium for all their communication related to the assignment. To encourage the use of this medium and their participation, they were told that they would be assessed based on their productive activity on Google Groups. Using Google Groups allowed individual students to be more flexible in contributing to group work; such that whenever and wherever they were they could contribute to the task. Moreover, being able to see what other groups were discussing also provided individual groups immediate feedback and motivation to work on the task. Data collection was through the Google Groups and main source of data was each individual pre-service teacher's comments, suggestions, arguments, questions, etc., presented in group discussions during the preparation of the assignment.

## RESULTS AND DISCUSSIONS

In our analysis, we have examined all the contributions made by the PSTs which were relevant to the purpose of the task. There were a total of 753 comments, under 52 separate topics sent by the participants. Of these comments, approximately 30% were discussions about the objectives from the cognitive domain of Bloom's taxonomy. Remaining comments were about other course requirements such as lesson planning, test construction, etc. For some of the objectives, PSTs spent quite a long 'time' (as represented by the number of comments) trying to decide whether the objective is at the 'analysis' or 'synthesis' level. Based on the comments, it appears that 'application' level was the easiest to identify. Most of the objectives, as perceived by the PSTs seemed to be from the 'comprehension' level. Table 1 presents the distribution of levels of learning objectives from the cognitive domain.

**Table 1. The distribution of learning objectives according to cognitive levels in secondary school physics programme of study.**

Grade Level Unit	9th						10th					11th						12th							Total
	1	2	3	4	5	6	1	2	3	4	5	1	2	3	4	5	6	1	2	3	4	5	6	7	
Knowledge	1	2	1	-	1	1	1	-	1	-	-	1	1	-	2	-	1	-	-	2	-	2	-	-	17
Comprehension	13	12	5	6	1	4	4	9	4	5	-	5	11	6	9	4	9	7	6	7	8	17	6	6	164
Application	2	-	2	6	1	1	1	4	4	-	7	3	6	4	8	3	-	4	3	4	19	1	2	-	85
Analysis	-	1	-	2	1	2	1	1	1	-	3	-	-	2	-	1	1	-	-	-	2	3	2	-	23
Synthesis	-	-	-	-	2	1	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	5
Evaluate	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	3	-	1	-	8

In analysing the learning objectives of the Physics PoS, they used Mager's ABCD format (Audience, Behaviour, Condition, Degree). However, since the level of an objective is related with the skill or knowledge to be attained, which is reflected in the verb, PSTs focused mostly on the verbs during discussions. As part of the course reading assignments, the PSTs were given a list of illustrative verbs obtained from Linn and Gronlund (1995). However, since these verbs were in English but the learning objectives of the physics education programme are in Turkish, they firstly translated the objectives into English and then compared the verbs against the list to decide the level of the objectives, which is a problematic process due to the PSTs' level of English proficiency. That is, sometimes translations were literal only, missing the meaning or their English translation of the verb was not present in the given illustrative verbs list. In addition to focusing their discussion on the verb, they also examined the nature of topic to give evidence for the level of objectives.

Discussions of the objectives started with identifying the level, without giving any reasons. However, PSTs later

gave reasons why they thought a particular objective was at certain cognitive level. As the units were distributed between the group members, the person who prepared the unit was, as one would expect, the dominant character in the discussion, which means that the other group members' contribution was limited in length. Nevertheless, they did discuss on many objectives and an agreement was reached.

It was noticed that the part of the learning objectives given in the brackets—referring to the skill objectives—were never used to decide the level of that objective from the cognitive domain. Although that part may include some information about the level of objectives, they never used it. Similar to the PSTs' not paying attention was also observed by Schibeci (1981), who stated that most teachers do not focus on attitude objectives, even when they believe that attitude objectives are not valueless.

## CONCLUSIONS

In this study, we set out to investigate pre-service physics teachers' difficulties in analysing the learning objectives of the Physics PoS. Distribution of perceived levels of the learning objectives given in Table 1 reflects the structure of Bloom's hierarchical model, according to which the higher levels include the previous one(s) (Bloom, 1956). It appears, therefore, that maximum number of learning objectives must be at *Knowledge* level. However, contemporary view of education shies away from the memorisation and put emphasis on comprehension. In this regard, one would expect comprehension level to consist most of the objectives, which was observed in the categorisation of the participants of this study. We must note that the categorisation of the pre-service physics teachers do not necessarily reflect the categorisation of experts in the field. Further research can investigate this aspect.

Even though the above conclusion may suggest that PSTs did not have any difficulty in identifying the levels of learning objectives, we found that they occasionally faced a difficult quandary. Deciding whether an objective is at analysis, synthesis or evaluation level was a difficult one for PSTs. The reason for PSTs to have such difficulties may be similar to the ones that resulted in the recent revision of the Bloom's Taxonomy. Krathwohl (2002) having also renamed some of the levels, changed the order of synthesis with evaluation.

Apart from having difficulty in identifying levels of learning objectives, PSTs did not have any difficulties in their analyses of the objectives regarding the *Condition* and *Degree* of the learning objectives. They realized some of the objectives contained conditions, while others did not. They also recognized that none of the objectives contained degree information.

Despite the fact that we did not intend to investigate the influence of the medium on PSTs involvement in and enjoyment from the assigned task, we deem it necessary to mention how positive an experience using Google Groups provided for the participants. While complaining about the time they spent on the task, they acknowledged that they learned a lot and enjoyed it. This in itself is a very useful outcome. It is apparent that the medium of communication allowed PSTs' to interact flexibly with each other without time or place constraints.

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