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# Fizik Öğretmenleri İçin İçerik-temelli İhtiyaç Değerlendirme Anketinin Analizi*

Özlem OKTAY**, Ali ERYILMAZ***

| Makale Bilgisi | ÖZET |
|---|---|
| *Geliş Tarihi*: 11.12.2018<br>*Kabul Tarihi*: 24.05.2019<br>*Erken Görünüm Tarihi*: 21.06.2019<br>*Basım Tarihi*: 30.04.2020 | Çalışmanın amacı, fizik öğretmenleri için içerik temelli bir ihtiyaç değerlendirme anketinin geliştirilmesi ve analiz edilmesidir. Bu amaçla, Fiziğin Doğası Konulu Eğitime Yönelik Öğretmen Görüş Anketi (FDÖGA) ölçme aracı olarak geliştirilmiştir. FDÖGA, meslekteki fizik öğretmenlerinin Fiziğin Doğası (FD) konulu mesleki gelişim programına (MGP) dayalı ihtiyaç, istek, beklenti ve problemlerini ortaya çıkarmak için kullanılmıştır. Çalışmaya meslekteki 60 fizik öğretmeni katılmıştır. FDÖGA; FD bilgisi ve kavram yanılgıları, öğretim stratejileri (yöntemler, teknikler), materyaller/teknolojiler ve değerlendirme teknikleri olmak üzere dört özel içerik alanı içermektedir. FDÖGA, yapılandırılmış ve yapılandırılmamış soru formatlarından oluşmaktadır. Araştırma, anket boyutları bazında analiz edilmiştir. Tematik kodlama kullanılmış ve sonrasında frekans analizi yapılarak tablolar yoluyla veriler sunulmuştur. FDÖGA sonuçları dört boyutta verilmiş ve tartışılmıştır; (a) katılımcılardan gelen demografik bilgiler, (b) daha önceki öğretmenlerin mesleki deneyimleriyle ilgili bazı sorular, (c) MGP'nın nasıl organize edilebileceğine dair bazı spesifik sorular (örn., türü, içeriği, MGP'deki roller, zaman, vb.) (d) öğretmenlerin eğitimle ilgili ek fikir ve düşünceleri. Son olarak çalışmada öğretmen eğitimi ve mesleki gelişim açısından bazı öneriler tartışılmıştır.<br>**Anahtar Sözcükler:** İhtiyaç değerlendirme, içerik-temelli anket, mesleki gelişim, fizik öğretmenleri |

# Analysis of a Content-based Needs Assessment Survey for Physics Teachers

| Article Information | ABSTRACT |
|---|---|
| *Received*: 11.12.2018<br>*Accepted*: 24.05.2019<br>*Online First*: 21.06.2019<br>*Published*: 30.04.2020 | The purpose of the study is to develop and analyze a content-based needs assessment survey for physics teachers. With this aim, a Teacher Survey on the Nature of Physics (TSNOP) was developed as a measurement instrument for the study. The TSNOP was used to identify inservice physics teachers' needs, wishes, expectations and problems for the Nature of Physics (NOP) unit of a Professional Development Program (PDP). A total of 60 inservice physics teachers participated in the study. TSNOP includes four specific content areas; NOP knowledge and its misconceptions, teaching strategies (methods, techniques), materials and technology, and assessment techniques. The TSNOP consists of structured and unstructured question formats. The survey was analyzed based on dimensions and thematic coding, followed by frequency analysis with data was represented through tables. The TSNOP results are presented and discussed under four dimensions; (a) participant demographics, (b) teachers' previous professional experience, (c) how PDPs can be organized (e.g., type, context, roles, time), and (d) teachers' opinions about the training. Implications for teacher training and professional development were also discussed in the study.<br>**Keywords:** Needs assessment, content-based survey, professional development, physics teachers |

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** Dr., Ataturk University, Kazım Karabekir Education Faculty, Department of Mathematics and Science Education, Erzurum, TURKEY. email: oktayozlm@gmail.com (ORCID: 0000-0002-0207-1211)

*** Prof. Dr., Middle East Technical University, Faculty of Education, Department of Mathematics and Science Education, Ankara, TURKEY. email: eryilmaz@metu.edu.tr (ORCID: 0000-0003-2161-6018)

## 1. INTRODUCTION

By definition, teachers significantly impact on their students' learning, and are ultimately responsible for both their students' academic success as well as their failures. Teachers are required to follow current innovations in their disciplines and have strong subject matter and pedagogical content knowledge. Teaching as a profession requires effective practices in the classroom. One way for teachers to become more effective is self-development through training. Teacher professional development is a process which addresses the intellectual and pedagogical growth of teachers on the job (Lieberman & Miller, 1992). Professional Development (PD) includes both formal (e.g., attending workshops or meetings) and informal experiences (e.g., reading academic literature) (Ganser, 2000). Most researchers have argued that a professional development program (PDP) for teachers is associated with teacher quality, which in turn relates to student success (Borko, 2004; Guskey, 2011; Margolis, Durbin, & Doring, 2017; Widodo, 2016). Therefore, teachers should attend training programs that are well-matched with current standards for the profession (Darling-Hammond, 2000).

In order to be effective, PDPs must include certain crucial characteristics that make them successful. However, most are ineffective and inadequate in meeting the required PD standards, and often ignore teachers' needs and requests (Walker, 2013). Many PDPs are ineffective because they are based on a "sit and get" traditional style of delivery, without the necessary focus on any relationship with the relevant curricula. There is generally a lack of coherence with current curricula, norms, teachers' experiences, or goals, and most are not well planned and organized. Mostly are held as 1-day workshops on generic subjects such as assessment or classroom management, without any direct correlation to actual classroom practices. Also, many PDPs are not directly linked to the context of the participants' areas of discipline (Oktay, 2015).

Similar difficulties have been noted in implementing PDPs in Turkey. The contents of inservice training programs provided by the Turkish Ministry of National Education (MoNE) are thought to be ineffective because they have not adequately considered the inservice needs of teachers (Gökdere & Küçük, 2003). Focusing on specific topics and issues (e.g., misconceptions of the Nature of Science (NOS), understanding of force concept in physics) makes PDPs more useful and purpose dependent. Content-based PD increases teacher knowledge, skills, practice and, consequentially, student achievement. PDPs are of vital importance to inservice science teachers. As a discipline area, science has more abstract concepts and therefore requires strong scientific knowledge in order to competently explain them to students. It is vital for teachers to have knowledge of the current innovations and to prepare themselves to use the latest pedagogical approaches in science teaching. PDPs must therefore focus on these important concepts and provide conceptual understanding relevant to the science discipline of the target participants. A study by Simon and Black (2011) found that only 59% of teachers indicated content-specific PD to be useful. According to a national survey in the United States, only about half of PD focuses on specific content areas in the related disciplines (Hochberg & Desimone, 2010).

One of the theories explaining the PD concept is adult learning theory. How people learn is critical to understanding learners and their learning process. Adult learning theory supports the importance of considering learners' needs (Knowles, Holton, & Swanson, 2005). According to Gordon (2004), motivation to learn originates in the needs and interests of learners. Every teacher has some form of previous experience. Identifying the needs, concerns, experiences and culture provides teachers with the opportunity to actively participate in the PD context. Additionally, if teachers take note of and recognize their needs, they are more likely to benefit from the PDPs. The literature has also strongly emphasized the importance of needs-based analysis prior to implementing any PDP (Lieberman & Wilkins, 2006; Ricketts & Duncan, 2005). Certain research has been undertaken on needs-based assessment as a part of PDPs, and from assessing post-training results.

In his study, Bethel (1982) assessed 254 elementary teachers' needs for a PDP and reported significant test score improvement in the area of teachers' science knowledge. Lieberman and Wilkins (2006) developed the Pathways model of PD, which forms three steps; (1) needs assessment, (2) determining PD pathways, and (3) reflection. Teachers' needs are identified based on adult learning theory and also on their development levels. Appropriate pathways refer to the selection of PD activities associated with curriculum standards. Lieberman and Wilkins (2006) reported a positive effect of the developed PDP and its effect on student learning. Similarly, Akkuş and Kadayıfçı (2007) designed an inservice training on laboratory usage with 23 high school chemistry teachers. At the beginning of the PDP, the needs and expectations of the inservice teachers were assessed. The course content was based on presentations about laboratory usage, demonstrations on subjects from the high school chemistry program, and the assessment of teachers while conducting experiments and planning experiments based on the application of new approaches. According to the results of their study, there was a considerable change seen in the teachers' educational approaches and laboratory application. The Texas Regional Collaborative (TRC) for Excellence in Science Teaching (2009) also conducted a PDP for science teachers. Their PDP content consisted of scientific literacy, constructivism view and the integration of communication technologies, standards-based instruction, equity, and authentic assessment strategies. The focus of the program was the collaboration between universities and the state education department. Over 700 science teachers participated in the program, and each received 100 contact hours during the program. A needs assessment was applied annually in order to understand teachers' specific needs. The PDP application resulted in increased teacher understanding and teacher confidence. Aydın and Çepni (2011) developed a professional support program for 14 science teachers in the use of Project-Based Teaching Method (PBTM) in their classes. First, interviews here held in order to determine the participant teachers' needs. The teachers then prepared projects in seven groups under the guidance of academicians. At the end of the study, the support program was found to have been effective in meeting the relevant needs of teachers on PBTM.

## 1.1. Statement of the Problem

In the scope of the current research, a specific physics unit from the 9th grade was selected as content of the PDP to be developed. Nature of Physics (NOP) first appeared as a subject in 2007 and then the physics curriculum in Turkey was updated in 2011. After a revision in 2013, the physics curriculum incorporated the NOP unit concepts under the name of Introduction to Science of Physics (ISOP). The 2018 current physics curriculum includes the ISOP unit and the same content for the 9th grade. Turkish curricular reforms have placed more emphasis on Nature of Science (NOS) and scientific literacy. Generally, NOS refers to the values and beliefs for developing scientific knowledge (Lederman, 2007). Scientific literacy, however, includes understanding the process of science and the relationship of science, technology and society, using scientific knowledge to explain the natural word, and developing personal decision-making and other related abilities in order to solve scientific issues (Atkin & Black, 2007). Basically, these units are based more on the NOS and scientific literacy aspects such as scientific knowledge (e.g., tentativeness, empirically-based), modeling, scientific methodology, and history of science examples.

The literature has indicated that both preservice and inservice teachers have common misunderstandings about the NOS aspects (Lederman, 2007). Some strongly held beliefs are that scientific knowledge is absolute truth, that theories become laws, models are real, and that there is a universal scientific method (McComas, 1998). In addition, there are other reasons to teach NOS, as it may improve learners' understanding of science content, their scientific literacy and their decision-making skills (Donnelly & Argyle, 2011). It is notable that ISOP is an introductory unit in the 9th grade Turkish physics curriculum, and can therefore affect students' attitudes towards physics. In addition, special competencies of physics teachers were published by the MoNE in 2011 (Millî Eğitim Bakanlığı (MEB) [Turkish Ministry of National Education], 2011) under three sections; (1) physics content knowledge, (2) physics education knowledge, and (3) physics literacy knowledge. NOS aspects are included within the scope of physics literacy knowledge that physics teachers require for their teaching career. Therefore, the researchers selected the NOP unit to be the subject of the current study's PDP and the content of the survey.

In addition to the target participants' general needs, discipline-specific needs should be incorporated within PDPs in order to achieve more realistic results. Concrete evidence collected from inservice physics teachers was aimed to be used in developing the NOP unit-based PDP. Teachers' demands and expectations from PDPs have not always received adequate attention (Yan, 2005). Systematic needs-analysis research reflecting on teachers' classroom realities should therefore be conducted as a prerequisite to developing a PDP. Teachers pass through different developmental stages in their professional life and therefore have different needs (Huberman, 1995). For that reason, teachers' needs should be periodically reviewed. There is still a need for further research in examining teachers' needs prior to making decisions about professional development initiatives. Diagnosis of needs can lead to the development of more effective programs.

## 1.2. Purpose of the Study

In this context, the purpose of the current study is to identify inservice physics teachers' needs, wishes, expectations and problems to be addressed within a NOP unit-based professional development program. In this study, content-based means were used in order to address specific subjects to improve teachers' knowledge in the discipline. The primary research question of the current study, therefore, is: *What are inservice physics teachers' needs for a Nature of Physics (NOP) unit-based professional development program?*

## 2. METHODOLOGY

This study is constructed according to survey methodology, which is considered suitable for the nature of the study based on the availability of research funds and time constraints. Needs assessment is an analytical stage conducted in order to explore particular problems, and to examine current situations in the area of research with the help of survey data. Needs assessment therefore provides data-driven and evidence-based results (Hayes & Robnolt, 2006).

## 2.1. Participants

Inservice physics teachers were the participants of the study. Announcements to teachers about the study were made through e-mail, social networks and websites, and by communicating with schools and the national education administration in Ankara. Criteria were set for teachers to complete the survey. The teachers should be working in state (public) or private high schools in Turkey, and they should teach physics at the 9th grade. They should have a notable interest in the effective teaching of the physics curriculum, and be willing to participate in the current study on a voluntary basis. Based on these criteria, 60 inservice physics teachers were selected to complete the opinion survey.

## 2.2. Data Collection Tool

A "Teacher Survey on the Nature of Physics Unit Professional Development Program" (TSNOP) was developed by the researchers based on their experience and was employed as the data collection tool for the current study. The purpose of the survey was to investigate teachers' needs for a PDP. Specially, the collected data were used for:

(a) selecting participating teachers for the PDP and for obtaining their demographic information;
(b) exploring teachers' previous PD experiences, issues, concerns and their ideas, and for finding possible solutions to known problematic areas;
(c) detecting specific content needs and other relevant information to model the PDP;
(d) gathering teachers' opinions about the PDP organization.

During the development of the TSNOP, current PD literature and needs-based analysis studies (e.g., Baird & Rowsey, 1989; Chval, Abell, Pareje, Musikul, & Ritzka, 2008; Heydon & Stooke, 2012; Mansour, Albalawi, & Macleod, 2014; Yerin Güneri, Eret Orhan, & Çapa Aydın, 2017) were investigated. The researchers met regularly in order to improve the survey as it developed over a period of 4 months. For the tool's face validity, expert opinion was sought from 13 experts (eight academicians and five physics teachers). The experts controlled the tool in terms of its content, language, format, clarity, accuracy, and appropriateness for its intended purpose. They also provided feedback about the readability and understandability of the TSNOP. The experts' overall agreement was found to be 95% for all items in the TSNOP. Additionally, a physics teacher was interviewed about the survey. The researchers asked the teacher to think aloud and to feel comfortable in expressing their opinion. The interview lasted almost 45 minutes. Based on all the feedback received, the survey was modified and applied as a pilot study to 22 physics teachers attending a different inservice training program as a means to assuring the tool's reliability. Following the pilot implementation, it was established that there was no need to apply further changes to the survey.

The TSNOP consists of structured and unstructured question formats. The instrument has 10 pages with four dimensions; (a) Participant demographics, (b) Teachers' previous professional experience, (c) How PDPs can be organized (e.g., type, context, roles, time), (d) Teachers' opinions about the training. Dimension A consists of six questions in the multiple-choice format. Dimension B consists of five questions as fill-in the blank, multiple-choice, open-ended, or 5-point, Likert-type scale questions. Dimension C consists of five questions as fill-in the blank or open-ended questions. Dimension D consists of five questions as multiple-choice or open-ended questions.

## 2.3. Procedure

The survey was sent to the inservice physics teachers by e-mail or distributed to the teachers' schools. One of the researchers maintained regular contact with the teachers or with the vice principals of their schools in order to encourage the return of the completed surveys. A total of 60 inservice physics teachers completed the survey, representing a 91% response rate.

Prior to implementing the TSNOP, an online-survey was prepared in order to decide upon the detailed content of the PDP. Physics teachers were contacted via social networks in Ankara, and a database was created of the teachers' e-mail addresses. The participating criteria was also announced to the teachers through a Google Docs survey. A total of 64 physics teachers were asked which content areas they would wish to attend in the PD program. An open-ended question was asked to teachers expressing their interest in more than one specific content area related to the NOP unit.

In summary, the online-survey includes teachers' contact details, participating criteria for attending a NOP content-based PD program, multiple-choice questions regarding participating in a PD program, and an open-ended question asking which content areas they would prefer to be included in the PDP. The results were; NOP knowledge and its misconceptions (80%), teaching strategies (methods, techniques) (75%), materials/technologies (68%), assessment techniques (65%), laboratory applications (40%), use of computers (28%), and other (e.g., classroom management, project development training) (15%). Considering these results and feasibility conditions, it was decided to design the PDP based on the four most requested content areas of the physics teachers.

## 2.4. Data Analysis

Descriptive statistics, including frequency and percentage, were used for the analysis of the TSNOP survey. In addition, content analysis was used for the open-ended question responses to the TSNOP. Data were categorized for each question. Thematic coding was performed according to the dimensions. The main categories were determined and then themes were constituted under these categories by the two researchers. The level of interrater agreement between the two researchers was 82% during the coding process, with discussions held in order to reach consensus on final decisions. IBM SPSS Statistics 24 was used for the analytical calculations. In the findings that follow, each part of the TSNOP was analyzed under the headings given in the TSNOP. In addition, direct quotations have been utilized at the relevant points to aid interpretation and reporting of the data.

## 3. FINDINGS

### 3.1. Participant Demographics

Table 1.
*Physics Teachers' Demographic Information*

| Variable | Value | Frequency | Percent |
|---|---|---|---|
| Gender | Male | 29 | 48.3 |
| | Female | 31 | 51.7 |
| Graduated | Education faculty | 44 | 73.3 |
| | Science faculty | 16 | 26.7 |
| Degree | BS | 43 | 71.7 |
| | MSc student | 2 | 3.3 |
| | PhD student | 4 | 6.7 |
| | Non-thesis MSc | 1 | 1.7 |
| | MSc | 8 | 13.3 |
| | PhD | 2 | 3.3 |
| High school type | Anatolian | 24 | 40.0 |
| | Science | 3 | 5.0 |
| | General | 22 | 36.7 |
| | Vocational | 11 | 18.3 |

According to Table 1, there are 29 males (48.3%) and 31 females (51.7%) in the sample, giving a total of 60 respondents. Of the 60 teachers, 44 are education faculty graduates and 16 from the science faculty. The teachers predominantly hold a Bachelor's degree (n = 43, 71.7%), with the others ranging from being enrolled as Master's students through to holding a doctoral degree. The high school types were distributed, in descending order, as Anatolian, general, vocational, and science, respectively. Additionally, the teachers' years of teaching ranges from 2 to 37 years, with a mean of 18.52 years and a standard deviation of 7.82. Of the participant teachers, 23 stated that they were teacher educators (formators), and four were assistant school managers in addition to their teaching role.

### 3.2. Teachers' Previous Professional Experience

When asked about work or project experience related to education and of their previous PD experiences, only seven of the teachers responded to this question. Three had previously worked on European Union projects related to misconceptions, and four had organized a science festival supported by the Scientific and Technological Research Council of Turkey (TUBITAK).

When the teachers were asked about their previous experience of inservice training they had attended, 29 of the 60 teachers stated that they participated in sort form of training. Of the 119 instances of training attended, 54 were in the form of courses, 56 were seminars, and nine were workshops. In total, 58 of these training cases had been purely theoretical, 14 of them were practical, and 43 of them were mixed theoretical and practical training applications. The average duration of the training was 22.7 days. The training contents were mostly directed to curriculum knowledge, while others were on basic computing, English (as a foreign language), assessment, guidance, projects, and material development. The teachers mostly participated in training organized by the MoNE. The majority of the training took place at inservice training institutes, followed by schools and universities. In terms of their roles in training sessions, 25 of the teachers had undertaken the role of listener participant for all of their training. Four of the teachers stated that they had also made presentations. In the "efficiency of training" section, which is rated from 5 to 0 (zero) (5, very efficient: 4, efficient: 3, moderately efficient: 2, little efficient: 1, inefficient: 0, neutral), the average of the 119 training instances was evaluated as being 3.5 (between moderately efficient and efficient).

Table 2 and Table 3 indicate the problems that the teachers reported as having experienced during their previous inservice training. The teachers also proposed potential solutions to these issues.

Table 2.
*Issues Related to Inservice Training, Plus Suggested Solutions Offered by Teachers (1)*

| Category | Issue | Suggested solution |
|---|---|---|
| Content | General topics unrelated to physics | Relate to physics curriculum |
| | Passive learning | Active learning |
| | Lack of new physics curriculum content | - |
| | Trainers' lack of knowledge | Lectures only by discipline experts |
| Personal/ general needs | Overcrowded environment | Working within small groups |
| | Lack of social activities | Taking part in social activities |
| | Technical incompetence, lack of Internet connection | - |
| | Accommodation problems, lack of food | - |
| Program | Unplanned organization | Set a program syllabus |
| | Program content unknown in advance | |
| Duration | Short-term duration | Long-term duration |
| Participation | Compulsory participation | Voluntary participation |
| Follow-up | Lack of follow-up after training | Observing classes following training |
| Other | Perceived as a holiday | Conducted within same province |
| | Knowledge level differences among participating teachers | - |

When considering the teachers' past experiences, they mostly criticized inservice training as having content that was too generalized. The teachers want to obtain new information and experience that directly provides benefit to their administering physics education. Another issue frequently mentioned from their previous inservice training experience was a lack seen in the instructors' knowledge.

The teachers want to take an active role in their training, rather than attend from a purely passive perspective. In any training, consideration needs to be paid to the attendees personal and general needs, as well as to the organizational requirements for the program such as ventilation, adjustment of physical environment in terms of seating arrangements, the provision of an Internet connection and offering of drinks and snacks during scheduled breaks in the training. Another subject criticized from the teachers' previous experience is that trainings are mostly short-term and participation compulsory. In general, no further communication is provided in follow-up to the training.

Table 3.
*Issues Related to Inservice Training, Plus Suggested Solutions Offered by Teachers (2)*

| Category | Issue | Suggested solution |
|---|---|---|
| Participation | Unwillingness | Providing motivation, making artefacts |
| Communication | Lack of knowledge sharing between teachers | - |
| Perception | Lack of belief in benefit of training | Showing evidence of change |
| Other | Lack of knowledge | Active learning during the training |

The teachers indicated the importance of self-motivation. They expect that the planned PDPs will provide certain benefits. Therefore, showing evidence of change from the training was one possible solution suggested by the physics teachers. They also expect to actively participate in the PDPs.

Some of the problems that may be encountered in the teaching of the NOP unit are listed in the TSNOP. If they had experienced any of these problems, the teachers checked the box next to the relevant item. The teachers were able to select more than one problem. The frequency (how many times) that the teachers indicated for each issue are as follows:

- Lack of educational resources for the unit: (f = 31)
- Place of the unit in the curriculum (order): (f = 14)
- Compared to other units, it is being taught new: (f = 24)
- Belief that the information is inadequate / incomplete: (f = 12)
- Belief that the topic of training is unnecessary: (f = 6)
- Lack of time: (f = 15)
- Environmental attitudes (e.g., students and their families consider the topic insignificant as not included in university entrance exams): (f = 16)
- Other: (f = 7)

The teachers mostly indicated there being inadequate resources for the NOP unit. In addition, the limits of the unit were deemed unclear and the students' negative attitudes towards the unit could be considered problems in the teaching of the NOP.

Additionally, the teachers stated that they do not effectively use teacher educators (formators) in their school to improve their professional development. In order to be more efficient, the teachers recommended compulsory meetings, regular controls, changing the current application, and the implementation of common strategies among teachers during their teaching.

## 3.3. How PDPs can be Organized

In terms of the PDP organization, the 60 participant inservice physics teachers were asked for their opinion on how the PD program should be designed (see Table 4).

Table 4.
*Results of TSNOP-PD Organization*

| | **Training type** | **Application** | **Preferred resources** | **Location** | **Expected trainers** |
|---|---|---|---|---|---|
| 9th grade NOP unit objectives | Workshop (47.7%)<br>Seminar (27.7%) | Theoretical & practical (61.4%)<br>Theoretical only (13.6%)<br>Practical only (4.5%) | Technological devices (61.4%)<br>Laboratory equipment (38.6%)<br>Internet (36.4%)<br>Books (34.1%)<br>Articles (27.3%)<br>Magazines (29.5%) | School (50%)<br>Outside school, within province or district (20.5%)<br>Outside of province (20.5%)<br>Distance learning (6.8%) | Academicians (68.2%)<br>Teacher trainers (36.4%) |
| | **Participant role** | **Training products** | **Application time** | **Training period** | **Frequency** |
| | Listener (38.6%)<br>Develop material (22.7%)<br>Give sample lectures (20.5%) | Worksheets (47.7%)<br>PowerPoint (45.5%)<br>Tests (43.2%)<br>Handouts (38.6%) | Before school day (45.5%)<br>During school day (20.5%)<br>End of school day (15.9%)<br>Needs-based (9.1%)<br>Summer (6.8%)<br>Weekends (2.3%)<br>Evening (2.3%) | 4 hours (31.3)<br>2 hours (12.2) | 2 hours per week (18.8%) |
| | **Training type** | **Application** | **Preferred resources** | **Location** | **Expected trainers** |
| Technology in teaching NOP | Seminar (29.5%)<br>Workshop (20%) | Theoretical & practical (43.2%)<br>Theoretical only (11.4%)<br>Practical only (9.1%) | Technological devices (59.1%)<br>Laboratory equipment (38.6%)<br>Internet (31.8%)<br>Books (29.5%)<br>Magazines (20.5%)<br>Articles (18.2%) | School (38.6%)<br>Outside school, within province or district (18.2%)<br>Outside of province (15.9%)<br>Distance learning (6.8%) | Academicians (50%)<br>Teacher trainers (27.3%) |
| | **Participant role** | **Training products** | **Application time** | **Training period** | **Frequency** |
| | Listener (38.6%)<br>Develop material (20.5%)<br>Give sample lectures (9.1%) | Worksheets (38.6%)<br>PowerPoint (38.6%)<br>Tests (34.1%)<br>Handouts (31.8%) | Before school day (34.1%)<br>End of school day (15.9%)<br>During school day (13.6%)<br>Needs-based (6.8%)<br>Summer (4.5%)<br>Weekends (2.3%)<br>Evening (2.3%) | 2 hours (23.5%)<br>4 hours (17.7%) | 2 hours per week (16.7%) |

Table 4. (continued)
*Results of TSNOP-PD Organization*

| | **Training type** | **Application** | **Preferred resources** | **Location** | **Expected trainers** |
|---|---|---|---|---|---|
| | Workshop (45.5%)<br>Seminar (20.5%) | Theoretical & practical (52.3%)<br>Theoretical only (9.1%)<br>Practical only (4.5%) | Technological devices (50%)<br>Laboratory equipment (40.9%)<br>Books (31.8%)<br>Internet (27.3%)<br>Articles (20.5%)<br>Magazines (20.5%) | School (45.5%)<br>Outside school, within province or district (18.2%)<br>Outside of province (15.9%)<br>Distance learning (9.1%) | Academicians (54.5%)<br>Teacher trainers (29.5%) |
| Assessment in teaching NOP | **Participant role** | **Training products** | **Application time** | **Training period** | **Frequency** |
| | Listener (34.1%)<br>Develop material (22.7%)<br>Give sample lectures (18.2%) | PowerPoint (43.2%)<br>Worksheets (40.9%)<br>Tests (38.6%)<br>Handouts (29.5%) | Before school day (38.6%)<br>During school day (13.6%)<br>End of school day (13.6%)<br>Summer (6.8%)<br>Needs-based (6.8%)<br>Weekends (2.3%)<br>Evening (2.3%) | 2 hours (35.7%)<br>4 hours (21.4%) | 2 hours per week (16.7%)<br>2 hours per month (16.7%) |
| | **Training type** | **Application** | **Preferred resources** | **Location** | **Expected trainers** |
| | Workshop (34.1%)<br>Seminar (25%) | Theoretical & practical (40.9%)<br>Theoretical only (9.1%)<br>Practical only (6.8%) | Technological devices (38.6%)<br>Laboratory equipment (34.1%)<br>Internet (31.8%)<br>Books (29.5%)<br>Articles (25%)<br>Magazines (25%) | School (34.1%)<br>Outside school, within province or district (18.2%)<br>Outside of province (15.9%)<br>Distance learning (9.1%) | Academicians (50%)<br>Teacher trainers (25%) |
| Material in teaching NOP | **Participant role** | **Training products** | **Application time** | **Training period** | **Frequency** |
| | Listener (29.5%)<br>Develop material (25%)<br>Give sample lectures (9.1%) | Worksheets (43.2%)<br>PowerPoint (36.4%)<br>Tests (34.1%)<br>Handouts (29.5%) | Before school day (36.4%)<br>End of school day (15.9%)<br>During school day (11.4%)<br>Needs-based (6.8%)<br>Summer (4.5%)<br>Weekends (2.3%)<br>Evening (2.3%) | 4 hours (33.3%)<br>2 hours (16.6%) | 2 hours per week (20%) |

Table 4. (continued)
*Results of TSNOP-PD Organization*

| | **Training type** | **Application** | **Preferred resources** | **Location** | **Expected trainers** |
|---|---|---|---|---|---|
| | Workshop (34.1%)<br>Seminar (20.5%)<br>Conference (15.9%) | Theoretical & practical (47.7%)<br>Theoretical only (11.4%)<br>Practical only (4.5%) | Technological devices (40.9%)<br>Laboratory equipment (36.4%)<br>Internet (29.5%)<br>Books (29.5%)<br>Magazines (27.3%)<br>Articles (18.2%) | School (38.6%)<br>Outside school, within province or district (18.2%)<br>Outside of province (15.9%)<br>Distance learning (6.8%) | Academicians (52.3%)<br>Teacher trainers (29.5%) |
| Teaching strategy in teaching NOP | **Participant role** | **Training products** | **Application time** | **Training period** | **Frequency** |
| | Listener (34.1%)<br>Develop material (18.2%)<br>Give sample lectures (9.1%) | Worksheets (40.9%)<br>PowerPoint (40.9%)<br>Tests (34.1%)<br>Handouts (27.3%) | Before school day (34.1%)<br>End of school day (15.9%)<br>During school day (13.6%)<br>Needs-based (9.1%)<br>Summer (2.3%)<br>Weekends (2.3%)<br>Evening (2.3%) | 2 hours (18.8%)<br>4 hours (18.8%) | 2 hours per week (20%) |

The most preferred training types were workshops and seminars. Workshops were demanded in four content dimensions (content/skill/misconception, assessment, material, and teaching strategy), whilst seminars were demanded in one dimension (technology). Combined theoretical and practical were by far the most demanded types of training across all dimensions. Using technological devices were the most preferred resources across all content dimensions. Laboratory equipment, the Internet, books, articles, and magazines were preferred at approximately the same rates in each dimension. The physics teachers mostly preferred training within school environment in all content dimensions. Some of the teachers stated that they preferred a physical location apart from their own school, provided that it was located within the same province or district. However, some teachers said that the physical location of the training was unimportant. Academicians were selected across all PD content dimensions as the preferred trainer type. The teachers stated that they want to participate in training as listeners, to develop material in training, and to give sample lectures. The teachers want to see worksheets, PowerPoint presentations, tests for different assessment purposes, and handouts as the PD training products. The most preferred timeframe for training was at the beginning and end of the school day. In addition, time-based participation was considered the most appropriate, with 2-4 hours reported across each dimension. In considering all five content dimensions in the TSNOP, it can be said that a total training time of 20 hours was expected by the teachers. Mostly, the teachers preferred a training frequency of 2 hours per week.

The teachers emphasized that communication should be available among them as peer trainees and with their instructors before, during and after the PD program. The teachers expressed their requests related to the communication during the PD program in Table 5.

Table 5.
*Communication in the PD Program*

| | |
|---|---|
| **Before the PDP** | |
| Between teachers | Determination of the training content (e.g., topic distribution)<br>Questioning, discussion (e.g., learning difficulties)<br>Introduction |
| Between teacher and instructor | Setting goals before the PD program<br>Determination of the training content (e.g., topic distribution)<br>Questioning, discussion (e.g., learning difficulties) |
| **During the PDP** | |
| Between teachers<br>Between teacher and instructor | Sharing knowledge<br>Giving feedback<br>Mentoring<br>Questioning, discussion |
| **After the PDP** | |
| Between teachers<br>Between teacher and instructor | Sharing knowledge<br>Sharing products<br>Sharing outcomes<br>Questioning, discussion |

The teachers expressed an interest in helping to determine the content of the PD program along with the instructors. Additionally, they stated that they wanted to discuss the subject content and to share learning difficulties experienced by their students with their peers and the PD program's instructors.

Measurement tools were identified by the teachers that they would like to see used, both for their own self-improvement and for the sake of their students in order to maximize the efficiency and effectiveness of the PD training (see Table 6 and Table 7).

Table 6.
*Measurement Tools for Teachers' Evaluation, with Reasons*

| Measurement tool | Before PDP (*f*) | During PDP (*f*) | After PDP (*f*) | Reasoning |
|---|---|---|---|---|
| Survey | 35 | - | 20 | Testing pre-knowledge and problems<br>Testing post-knowledge |
| Interview | - | - | - | |
| Achievement testing | 16 | - | 40 | Testing PDP's effectiveness |
| Performance-based assessment tools (portfolio, observation forms, etc.) | - | - | - | |
| Other | - | - | - | |

When the teachers' responses were evaluated, it was seen that they mostly preferred achievement tests and surveys for their evaluation. They prefer to be evaluated by the PDP's instructors, who they expect to be academicians and experts in the NOP field.

Table 7.
*Measurement Tools for Students' Evaluation, with Reasons*

| Measurement tool | Before PDP (*f*) | During PDP (*f*) | After PDP (*f*) | Reasoning |
|---|---|---|---|---|
| Survey | 8 | - | 8 | Testing pre-post knowledge |
| Interview | - | - | - | |
| Achievement testing | 26 | | 39 | Testing PDP's effectiveness |
| Performance-based assessment tools (portfolio, observation forms, etc.) | - | - | - | |
| Other | - | - | - | |

The teachers mostly preferred achievement testing and surveys for their evaluation before, during and after any PD program they would attend. They want to evaluate themselves as students or with academicians from the PDP.

Considering the type of support suggested to increase participation, the most important demand by the teachers from MoNE was financial support. They claimed that expenses incurred when attending PD training should be covered, in addition to continuation of their course fee payments. The teachers' opinions on the support required to increase PD participation are presented in Table 8.

Table 8.
*Support Required to Increase Participation*

| Support giver | Support types |
|---|---|
| MoNE | Expenditure (remuneration)<br>Continued tuition fee payments during training<br>Permission<br>Certification |
| PD provider | Material/technology support<br>Lecturing from academicians/experts<br>Planned organization<br>Mentoring |

The teachers stated that schools should provide the necessary permission for their participation. Another support mentioned was the issuance of certificates approved by the MoNE. In terms of support expected from the PD providers, they are mostly academic in nature. The most important mentioned was material/technology support. The teachers stated that training should be given by experts in the field being trained. Planned PD organization was mentioned by the teachers as an expectation from the PD program providers.

## 3.4. Teachers' Opinions about the Training

At the end of the survey, the physics teachers were asked to participate in the PD program after obtaining the necessary permits from MoNE. Accordingly, 20 of the physics teachers (nine males, 11 females) with an average of 14 years teaching experience responded positively to their involvement in the program. Some teachers indicated additional points related to the training at the end of the survey. Two such examples were as follows:

> *"It was a very detailed survey. I think it would be quite efficient if this training is done." (Teacher 4)*
> *"A preliminary comprehensive assessment survey that meets more than expectations. It should be done for other units as well." (Teacher 51)*

## 4. RESULTS, DISCUSSION and RECOMMENDATIONS

The study's objective was to consider the needs of physics teachers prior to conducting a professional development program (PDP). With this aim, inservice physics teachers' needs, concerns, problems, and wishes were examined, and a Teacher Survey on the Nature of Physics (TSNOP) was developed and administered to Turkish high school physics teachers. The TSNOP was based on the Turkish 9th grade NOP unit, which is known as the ISOP unit in the 2013 physics curriculum, as the specific content selected as the core subject of the needs-based assessment.

The TSNOP is a content-based structure, with a specific subject aimed at improving knowledge in the discipline of study. Darling-Hammond and Richardson (2009) stated that PD programs should focus on curriculum content in order to improve student learning. Research studies have agreed that content-based PD significantly impacts on teacher practices (Blank & de la Alas, 2009; Owston, Sinclair, & Wideman, 2008). Therefore, one purpose behind the TSNOP was to identify inservice physics teachers' needs for a PD program, with the content based on the ISOP (NOP) unit.

The TSNOP includes four specific content areas; NOP knowledge and its misconceptions, teaching strategies (methods/techniques), materials/technologies, and assessment techniques. This is based on content knowledge, using materials, learning methods, and assessment being considered the core elements of any curriculum (Saylor, Alexander, & Lewis, 1981). The TSNOP has four dimensions (participants demographics, teachers' previous professional experience, how PDPs can be organized, and teachers' opinions about the training), with each including a detailed structure. A total of 60 high school physics teachers, who were educated from Bachelor's degree to Doctoral degree level and from different high school types, completed the survey. Some of the teachers also held administrative posts such as assistant manager at their school.

Considering the teachers' previous experiences, only seven had worked or been involved in projects related to education. The number of teachers previously involved in some form of inservice training was also found to be at a low level, with most training being purely theoretical, and mostly on generalized education-focused topics. The teachers considered themselves to be passive receivers of knowledge in their previous training. The teachers were mostly unsatisfied with the knowledge levels of the instructors who delivered their previous training. This result is consistent with previous research that highlights an important characteristic of PD being the trainers' quality (Van den Bergh, Ros, & Beijaard, 2015). The teachers wish for consideration of their needs such as the physical training environment, and prefer not to attend short-term or compulsory training. PD models that are based on transferring predefined knowledge given in a dominant mode and in a very short time are not seen as effective (Schwille & Dembele, 2007). The teachers expect to be motivated in some way such as being awarded attendance certificates endorsed by the MoNE. In terms of the NOP unit, they mostly complained about a lack of educational resources for teaching the unit, and indicted that they did not benefit effectively from teacher educators (formators) in their schools. The main problems that the teachers determined with regard to inservice training in Turkey was the lack of educational needs planning through scientific means, insufficient investment for inservice training, inappropriate usage of expert staff within institutions, and ineffective assessment of inservice training activities (Pehlivan, 1997).

In terms of PD organization, the teachers specified their opinions in some detail. They mostly preferred workshop-style training, delivered within four content dimensions (content/skill/misconception, assessment, material, and teaching strategy), and seminar-style training for the technology dimension. The preference for workshops is consistent with the findings of Jones, Gardner, Robertson, and Robert (2013), in which teachers rated science content workshops as the most effective forms of PD. The reasons stated included that the practical nature of the given subjects may be learned better in a workshop environment, and that some technical subjects may be better understood by listening to experts in a seminar. Combined theoretical and practical application were the most favored for the PD content dimensions as efficient learning is mostly realized within an active learning environment. Subjects are more clearly understood when taught both theoretically and practically, as well as being more attractive to learners.

Using technological devices were the most preferred resources for PDPs across all content dimensions. Laboratory equipment, the Internet, books, articles, and magazines were preferred less, but at approximately the same rates for each dimension. The teachers considered that a variety of resources employed enriches the content of any training. In addition, opinions held for each type of source holds value in itself, and the usage of various resources can increase efficiency. The physics teachers mostly preferred training within the school environment for all five content dimensions, since transport is less of an issue and therefore a local environment can make the PDP more efficient. However, although it was advocated that PDPs should be held in the workplace, there is no concreate evidence to support this approach in the literature (Smith & Gillespie, 2007).

The teachers preferred academicians as trainers across all PD content dimensions, stating that training would be more efficient with academicians who were experts in their field. According to Putnam and Borko (2000), teachers and university educators could create new forms of effective conversation. In the survey, the teachers stated that they wanted to be listeners, material developers, and lecturers. The reason for wanting the role of a listener is that learning by listening to subject contents is important in training. In terms of preferring a role developing material, it is considered important to develop activities that can be used in the teaching of NOP as a follow-on from theoretical training. Additionally, learning by doing becomes more permanent. If teachers take part in active learning environments during their training, the usefulness of the PDP may subsequently increase (Van Driel, Meirink, van Veen, & Zwart, 2012).

According to the surveyed physics teachers, it is important to apply knowledge and then to receive feedback, if given a role such to provide sample lectures. Teachers need to receive feedback from their peers as well as from the coordinators of professional development programs they attend (O'Brien 1992). The receiving of feedback was also mentioned as an important point by Morrison (2014).

The teachers reported wanting to see worksheets, PowerPoint presentations, tests for different assessment purposes and handouts as PD products. Worksheets facilitate expression, and can increase levels of student participation. PowerPoint presentations can enhance the training by making subject content visual and thereby more attractive. The use of tests for different assessment purposes enriches student learning and assessment. According to the teachers' survey, tests prepared for different purposes can also add to time-based efficiencies throughout the teaching semester. Handouts are a way for students to receive summary contents. The teachers most preferred timeframe for training was at the beginning and end of the school day, as it can provide the opportunity for preparation prior to applying subjects at school, and time-based participation is the most preferred. The reason for some preferring training application at the end of the school day is that it provides the opportunity to evaluate lessons within the same time period and to apply corrections while the topic is still recent. A total training time of 20 hours was suggested in the TSNOP. Similarly, a study by Supovitz and Turner (2000) showed that teachers implemented less effective teaching practices when their total PD time was between 1 and 19 hours.

The teachers suggested occasional and short-term training should be spread out over a longer period. This result is consistent with previous research in that effective PD should be both sustained and intensive (Guskey & Yoon, 2009). Change takes time, so the duration of PD can be an important indicator for an effective program. PD needs to be periodic. One-shot (top-down) PDPs that are not sustained, and with no follow-up are not considered to be ideal PD models (Cranton & King, 2003). The teachers afforded importance to the types of communication between teachers, and between the teachers being trained and their PD instructor before, during, and after the PDP. The literature also confirms that communication is an important vehicle in PDPs (Park, Oliver, Johnson, Graham, & Oppong, 2007). For example; the teachers demanded communication between teachers as peers in order to establish the content of the training, questioning and discussion. Mostly, teacher PD programs are seen as non-collaborative and lacking in interaction among the participants (Roberts, 2010). The teachers stated wanting to communicate with the instructor in terms of setting goals, determining the content of training, questioning techniques and discussion before the PDP. During the PDP, they preferred to share knowledge and provide feedback when communicating with their colleagues, whilst wanting their instructor to act in the role of mentor. In addition, questioning and discussion should be held between the teachers and the PD instructor. After the PDP, the teachers themselves should share their new knowledge, products and outcomes. Questioning and discussion should not end with the instructors at the end of the PDP.

The teachers also requested that achievement tests and surveys be evaluated by the PDP instructor, and also requested access to the same tools for evaluation of their own students. According to the teachers, they would evaluate their students themselves or with academicians from the PDP. In terms of the support requested, the teachers asked for financial support from the MoNE to over their expenses when attending PDPs. They also stated needed permission should be more easily obtainable from their schools' administration in order to participate in PDPs. From the PD provider, the teachers requested material and technological support. They stated that training should be given only by experts in the field of training. Organizational arrangements (such as promotional activities) have been recommended for the motivation of teachers to participate in PDPs (Yurdakul, Çakar, Uslu, Yıldız, 2014). At the end of the survey, the teachers pointed out that the TSNOP was a very comprehensive survey, and that similar surveys should be developed for other physics units.

Combining teachers' needs in the program structure, design, implementation, and evaluation is extremely important, but at the same time a challenging task (Oktay, 2015). Investigating the needs of teachers must be taken seriously before conducting any PDP aimed at inservice teaching professionals. Detailed research can be of significant use when determining the needs of teachers. For this purpose, in addition to the thoughts and experiences of just one teacher, uncovering the real needs a group is the more realistic approach. Scientific research methods and instruments should be applied when analyzing PD needs (Ozer, 2004).

This current research was based on data collected by way of a self-report survey. Different data collection methods such as conducting interviews with teachers, or recording the written reflections of teachers can also be employed in needs-based analysis. In addition, seeking students' thoughts and the observation of teachers during teaching can be considered a useful approach in determining teachers' needs and current teaching requirements. Quantitative approaches may also be used when conducting needs-based assessment in order to verify the generalizability of the results.

In the current study, data was gathered only from inservice physics teachers working in high schools across Ankara, Turkey. Larger sample sizes from different regions of Turkey could provide for a more robust analytical result. Whilst the TSNOP is directly applicable to 9th grade NOP unit-based PD programs, with certain modifications it may also be applicable to teachers across various subject areas and disciplines. Different types of needs such as school-based needs could also be examined at the beginning of designing a PDP. Teachers could be categorized as novice or veteran in order to elicit their different needs in more depth. It is hoped that the results of this research will be significant to researchers as evidence of a successful PD application. It is believed that these findings could contribute to the planning and organizing of PDPs, and to professional development opportunities offered to teachers and researchers of PD. Training planners of both inservice and preservice teachers should undertake additional research in order to conduct a careful review of student teachers' needs, and to seek out additional information that would benefit the professional development of teachers across different disciplines.

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## 6. GENİŞ ÖZET

Bu çalışmanın amacı bir mesleki gelişim programı öncesinde meslekteki fizik öğretmenlerinin hazırlanacak mesleki gelişim programına yönelik ihtiyaçlarını, isteklerini, beklentilerini ve önerilerini içerik-temelli bir ihtiyaç analizi anketi ile ortaya koymaktır. Öğretmenler, öğrencilerin öğrenmelerinde önemli bir etkendir. Onların disiplinlerindeki yeni gelişmeleri takip etmeleri ile beraber, iyi bir pedagojik alan ve konu bilgisine sahip olmaları gerekir. Etkili öğretmen olma yollarından biri ise eğitimler yoluyla kendilerini geliştirmekten geçer. Mesleki gelişim programları (MGP) bu anlamda oldukça önemlidir. Bu programların etkili olmaları için sahip olmaları gereken birtakım özellikler vardır. Birçok MGP mesleki gelişim standartlarını karşılayamayan özelikte olup, öğretmen ihtiyaçlarını göz ardı etmektedir. Bu programlar, geleneksel yaklaşımla hazırlanmış, öğretim programlarına uyumsuz, genel konulardan oluşan içerikle öğretmenlerin beklenti ve amaçlarından uzaktırlar. İçeriğe uyumlu ve içeriğe iyi entegre edilmiş MGP'ları öğretmenlerin bilgi, beceri ve sınıf içi uygulamalarını zenginleştirecek ve nihayetinde öğrencilerinin başarılarını artıracaktır. Yetişkin eğitimi teorisi de öğretmenlerin ihtiyaçlarının belirlenmesinin MGP'larının başarıları için önemli olduğunu vurgulamaktadır.

Bu çalışma kapsamında 2007 öğretim programındaki adıyla Fiziğin Doğası (FD), 2013 ve 2018 programlarındaki 9. sınıf Fizik Bilimine Giriş (FBG) ünitelerine özgü bir ihtiyaç analizi anketi hazırlanmıştır. Yenilenen fizik öğretim programları, Bilimin doğası (BD) ve bilimsel okuryazarlık konularından bir kısmına bu ünite içeriğinde yer vermektedir. Bilimin doğasını ve bilimsel okuryazarlık algısını kazanan birey, bilimsel bilginin yapısını ve nasıl geliştiğini anlayan, bireysel karar verme mekanizması gelişmiş, bilimsel sorunları ve problemleri çözebilen teknoloji farkındalığı olan bireydir. Bu konuda alanyazında sıkıntılar ve mecvut kavram yanılgıları oldukça fazladır. Bu amaçla bu konu baz alınarak verilecek eğitimle genel ihtiyaçların yanında, disipline özgü ihtiyaçların da belirlenmesi hedeflenmektedir.

Araştırma nitel bir tanımlayıcı çalışma özelliğindedir. İhtiyaç analizi yapılarak mevcut problemlerin incelenmesi ve buradan yola çıkılarak veri temelli kanıtlarla beklenti ve isteklerin belirlenmesi sağlanmıştır. Altmış fizik öğretmeni çalışmanın katılımcılarıdır. Bu öğretmenlere sosyal medya ve okullarıyla iletişimler aracılığıyla duyurular yapılmış ve anketler ulaştırılmıştır. Anketleri yapmak için belirlenen kriterler; öğretmenlerin özel veya devlet okullarında görev yapması, 9. sınıfa ders anlatması, fizik öğretimini derslerinde etkili kullanmaya istekli olması ve çalışmaya gönüllü katılmayı istemesi olarak belirlenmiştir. Veri toplama aracı araştırmacılar tarafından geliştirilen "Fiziğin Doğası" konulu eğitime yönelik öğretmen görüş anketi'dir (FDÖGA). Bu anket: (a) MGP'na katılımcıların seçimi ve demografik bilgilerini alma, (b) öğretmenlerin geçmiş MG tecrübelerini, sorunlarını, fikir ve düşüncelerini ortaya çıkarma ve problemli kısımlara olası çözümler bulma, (c) özel içerikle ilgili ihtiyaçları belirleme ve MG modeli için bilgi elde etme, (d) MG organizasyonu için her türlü fiki ortaya çıkarma amaçlarıyla kullanılmaktadır.

Anketi geliştirme aşamasında güncel MG alanyazı ve ihtiyaç analizi çalışmaları incelenmiştir. Araştırmacılar düzenli toplantılar yaparak dört aylık bir süreç içinde anketi geliştirmişlerdir. Uzman görüş formu oluşturularak sekiz akademisyen ve beş fizik öğretmeninden görüş istenmiştir. Anketin içerik, dil, format ve gelişim aşamasına uygunluğu test edilmiştir. Bir fizik öğretmeni ile görüşme yapılarak ayrıca anket ona doldurtulmuştur. Uzmanlar arasında %95 uyum bulunmuştur. Yine farklı bir eğitim programına katılan 22 fizik öğretmenine anket uygulanmadan önce dağıtılmış, her hangi bir sorun olup olmadığı test edilmiştir. Yapılandırılmış ve yapılandırılmamış sorulardan oluşan anket 10 sayfa olarak son halini almıştır. Altmış öğretmenin anketi cevaplama oranı %91'dir. FDÖGA uygulanmadan önce MG programının ve FDÖGA'nin detaylı konu içeriğinin belirlenmesi için sosyal medya üzerinden çevrimiçi bir soruluk anket hazırlanıp fizik öğretmenlerine sorulmuştur. Bu anketin sonuçlarına göre dört boyutta; içerik/beceri/kavram yanılgısı (%80), öğretim stratejisi (%75), material/teknoloji (%68) ve değerlendirme teknikleri (%65) öğretmenler tarafından istenen konu alanları olarak belirlenmiştir. Her bir soruya göre veri kategorize edilmiş ve her kısım için tematik kodlama yapılmıştır. Ana kategoriler belirlenenerek temalar bu kategoriler altında oluşturulmuştur. Frekans tabloları ve yüzdeliklerle veriler IBM SPSS 24 programı kullanılarak tablolaştırılmıştır.

Örneklemde 29 erkek (%48,3) ve 31 kadın (%51,7) olmak üzere toplam 60 katılımcı bulunmaktadır. 44 öğretmen eğitim fakültesi ve 16'sı fen fakültesi mezunudur. Fizik öğretmenleri lisans programından doktora programına kadar farklı derecelerdedir. Okul türleri sırasıyla Anadolu lisesi, genel lise, mesleki lise ve fen lisesi olarak dağılmaktadır. Öğretmenlerin mesleki tecrübe ortalamaları yıl olarak 18.52'dir. Yirmi üç fizik öğretmeni formatör, dördü ise okullarında müdür yardımcısı olduklarını belirtmiştir. Öğretmenlerin önceki deneyimleri dikkate alındığında, sadece yedi öğretmen eğitim ile ilgili çalışma/projeye katılmıştır. Hizmet içi eğitimde yer alan öğretmenlerin sayısı düşük düzeydedir. Daha önceki eğitimlerin çoğunun teorik olarak yapıldığı ve içeriğin genel konulardan oluştuğu belirtilmiştir. Öğretmenler önceki eğitimlerde pasif dinleyici olarak katılım göstermişlerdir. Bu eğitimlere katılan eğitmenlerin bilgi düzeyleri ve eğitimlerin organizasyon ile ilgili kısımları (ör; havalandırma, fiziki çevre, vb.) yetersiz bulunmuştur. Kısa süreli ve zorunlu eğitimlerin istenmediği ve öğretmenlerin bu eğitimlerden sertifika gibi motive edici yollar bekledikleri görülmektedir. Yine FD konusunda eğitim kaynaklarının azlığı belirtilmektedir. Öğretmenler okullarında formatör öğretmenlerden yeterli düzeyde yararlanamadıklarını ifade etmişlerdir. MGP organizasyonu açısından, öğretmenler görüşlerini detaylı olarak belirtmişlerdir. Eğitim türü olarak dört içerik boyutunda çalıştay, teknoloji boyutunda ise seminer istemektedirler. Hem teorik hem de pratik bir eğitim beklemektedirler. Teknolojik araçları kullanmak istediklerini belirtmişler, yine eğitim ortamında kitap, makale, dergi, laboratuvar ekipmanı talep etmşlerdir. Fizik öğretmenleri, ulaşım kolay olduğundan ve bu ortamın MGP'nı daha verimli hale getireceği düşüncesiyle okul ortamında MGP'nın uygulanmasını daha çok tercih etmişlerdir. Eğitmen olarak tüm içerik boyutlarında akademisyen isteği olmuştur. Öğretmenler ürün olarak çalışma sayfalarını, PowerPoint sunumlarını, farklı değerlendirme amaçlı testleri görmek istemektedirler. Eğitim için okulun başı ve sonu çoğunlukla tercih edilen zaman dilimi olmuştur. Toplamda ise 20 saatlik bir eğitim süresi talep edilmiştir. Öğretmenler, öğretmen-öğretmen, öğretmen-eğitmen etkileşimine MGP öncesi, sırası ve sonrasında önem vermektedirler. Ek olarak kendilerinin eğitmenler tarafından başarı testleri veya anketler aracılığıyla değerlendirilmelerini talep etmişlerdir. Eğitimden sonra ise öğrencilerinin de yine aynı araçlarla, fakat kendileri tarafından değerlendirilmelerini istemektedirler. Destek olarak Milli Eğitim Bakanlığı'ndan (MEB) maddi destek ve okullarından kolay izin alma beklentileri mevcuttur. MGP'nın alan uzmanları tarafından verilmesi gerektiği yine öğretmenler tarafından belirtilmiştir. Öğretmenler FDÖGA'nin çok kapsamlı bir anket olduğunu belirtmişler ve diğer fizik konularında yapılacak MGP'ları içinde bu tarz anketlerin geliştirilmesi gerektiğini ifade etmişlerdir.