

*Full Length Research Paper*

# Assessment of in-service training activities for junior high mathematics teachers

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The current education system aimed to train active deliberative individuals who learn to learn with the adoption of the constructivist educational approach. Based on this objective, there have been significant changes in the roles of teachers. To assist the development of teachers, the Ministry of Education organizes several in-service training activities every year. The present study aimed to assess an in-service training activity organized by the Ministry for mathematics teachers based on the teacher views. The study was a case study, which is a qualitative research model. The study group consists of 12 junior high school mathematics teachers who were selected by sampling method from approximately sixty junior high school mathematics teachers who participated in the activity. A semi-structured interview form was used to collect data in the study. The present study scrutinized the expectations, experiences during the process and recommendations of the teachers about the in-service training activity they participated in, and obtained qualitative data obtained were analyzed with the descriptive analysis method. Study findings demonstrated that participating teachers mostly participated in the activity to "learn different teaching methods and techniques". Since the training activity was a "special instructional methods and techniques-mathematics" seminar, the aforementioned expectation was a priority for the teachers. Almost all participants stated that the most positive aspect of the training they attended was "to exchange information with their colleagues." Furthermore, certain teachers participating in the seminar stated that they refreshed their knowledge in the process, while others mentioned that they learned new information.

**Key words:** Mathematics teachers, in-service training, instructional methods and techniques, constructivism.

## INTRODUCTION

The advances and innovations in the fields of information and technology during recent years introduced significant changes in the field of education (Acar and Anil, 2009; Birgin and Gürbüz, 2008; Günbayı and Taşdenek, 2012; Sağlam-Arslan et al., 2008). As a result of these

changes, new approaches could help train active, inquisitive and productive individuals with problem-solving and critical thinking skills (Acar and Anil, 2009; DiMartino et al., 2007; Sağlam-Arslan et al., 2008).

The most effective and fundamental method of keeping

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up with these advances is undoubtedly "education". Countries, institutions and individuals need to prioritize education to follow these developments and maintain their knowledge base on innovations (Gül, 2000). This approach, which is based on collaborative methods and focus on constructivism (Graue, 1993) was also adopted in Turkish education system as well. However, for the constructivist approach to be successful, it was necessary to change the roles of the teachers, since changing only the curricula was not sufficient (Ayan, 1999). Because, it is the teacher that would transfer all these rapid developments to their students. The teacher is at the center of the education and instruction services. It is recognized that the quality of education in schools is associated with the teachers' professional development levels in their respective fields and teaching methods (Klinzing et al., 2002; Lewin, Guskey, 2003; 1990; Spector, 1987).

However, it is a very difficult process for teachers to follow developments in different fields and to continue their personal development based on these developments, and transfer the related knowledge to their students (Önen et al., 2008). It is known that the individual efforts of teachers who want to improve themselves are not always sufficient for their professional development (Richert, 1991). In other words, how should the teachers, who aim to educate active, inquisitive, problem-solving, critical thinking and productive individuals, develop and adapt themselves to these advances?

It is clear that the constructivist teaching approach is responsible for the increase in the responsibility and duty of the teachers. Thus, the constructivist teaching approach requires the teachers to command their field and increase the productivity of the learning-teaching process by applying different approaches and methods-techniques in their classes. Therefore, in-service training programs for teachers play a very important role in teachers' personal and professional development (Önen et al., 2008).

In-service training is the self-training or education that a professional participates during his or her professional life (Aytaç, 2007). In-service training for teachers could be defined as all related processes that enable the teachers to acquire the skills, attitudes and habits required to train the students to achieve the qualities that are the goals of education, and the professional knowledge, skills, attitudes and habits that they lack as evidenced with scientific and socio-economic facts (Budak, 1998).

In-service training, which is a part of lifelong education, aims to provide employees with the knowledge, skills and attitudes that would enable them to become more successful, productive and happy individuals in their professional lives (Yalın, 2001). Furthermore, to increase the quality of the education system and instruction, not only the teacher but all the school personnel should attend in-service training for the same purpose (Fullan, 1991).

According to Garmston (1998), the qualities of having a professional teacher identity are to possess a strong field knowledge, to have extensive knowledge on teaching methods, to have knowledge on child development and learning theories, to be sensitive about the learning styles of the students in the classroom, to have an understanding about own advantages and disadvantages about the norms and value judgments. Thus, the three fundamental elements of in-service training are:

- (1) Training the teacher to acquire professional skills.
- (2) Providing knowledge to enable the acquisition of these skills.
- (3) Influencing the teacher behavior in the positive direction (Önen et al., 2008).

The benefits of in-service training activities for teachers are promoting professional development by increasing the scientific, educational and individual competence of teachers, promoting teachers' professional satisfaction, improving the performance of teachers, instructional material and the teaching atmosphere and conditions (Haris, 1989, as cited in Silvester, 1997).

Various previous studies frequently demonstrated that teachers should attend in-service training for better adaptation to the system (Akpınar and Ergin, 2005; Birgin, 2010; Birgin et al., 2008; Demirtaş, 2008; Kaplan, 2006; Nartgün, 2006; Özen, 2006). The Ministry of National Education also attempts to serve this purpose through several in-service training activities on a local and national basis that it organizes every year. However, the teachers' activities to transfer the things they learned in-service training and whether they remember the training content is more important than the topics instructed in the training (Mutshekwane, 1999).

Based on the results of various studies, teachers stated that they still did not receive sufficient in-service training (Bal, 2008; Birgin, 2010; Birgin et al., 2008; Demirtaş, 2008; Kaplan, 2006; Nartgün, 2006; Gökçer, 2011; Özen, 2006), and they were not competent in practicing teaching methods and techniques in particular and wanted to receive education in this field (Birgin and Baki, 2009; Çiftçi, 2010; Doğan et al., 2007; Erdal, 2007; Gelbal and Kelecioğlu, 2007; Gök and Şahin, 2009; Güler et al., 2015; Günbayı and Taşdöğen, 2012; Kramer et al., 2015). Those who organize in-service training programs should prioritize the educational needs of the participants (Wooden and Babtiste, 1990). However, the findings of the present studies did not reveal evaluations on in-service training activities for mathematics teachers.

Mathematics was always considered as a fundamental course for the comprehension of the life and the world, and production of knowledge. The instruction of the mathematics course is as significant as the course itself. Because, one's approach to mathematics is associated with how mathematics was learned by this individual (Hare, 1999). Therefore, mathematics teachers are significant in learning mathematics. Thus, it could be

**Table 1.** Participant demographics.

Teachers	Gender	Professional seniority (year)	Education level	Place of duty	Previous in-service training	Source of the information about the activity
T1	Female	9	Undergraduate	Tunceli	No	Province Nat. Ed.
T2	Male	12	Undergraduate	Artvin	Yes	School admin.
T3	Male	10	Undergraduate	Trabzon	Yes	Mebbis*
T4	Male	7	Undergraduate	Kırıkkale	No	Mebbis*
T5	Male	17	Undergraduate	Aydın	No	School admin.
T6	Male	16	Undergraduate	Isparta	Yes	School admin.
T7	Male	11	Undergraduate	Sivas	No	Official letter
T8	Male	9	Graduate	Zonguldak	No	Mebbis*
T9	Female	7	Graduate	Hatay	No	Recommendation
T10	Female	6	Undergraduate	Kayseri	No	Mebbis*
T11	Male	5	Undergraduate	Sakarya	No	Recommendation
T12	Female	6	Graduate	Malatya	No	Recommendation

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argued that it is very important for teachers to organize their classes to guide the students towards knowledge instead of directly conveying the knowledge, and the use of different methods-techniques and approaches during this process. However, previous studies demonstrated that teachers did not have adequate knowledge on different methods, and techniques that would allow their students to participate actively in the classroom (Gönen and Kocakaya, 2006).

The present study aimed to obtain the expectations, views and recommendations of mathematics teachers who participated in the national scale "in-service training activities" organized by the Ministry of National Education for Mathematics teachers.

## METHODOLOGY

The researchers tried to collect detailed data about "teaching methods and technics (mathematics) for the purpose. The research is a qualitative case study. A case study deals with analyzing one or more cases in their context (environment, time, etc.) in details (Yıldırım ve Şimşek, 2011). In this research, the training activity in question was analyzed in its own environment and time in details. In the present study, the case was the in-service training activity attended by approximately sixty junior high school mathematics teachers. As sampling method, extreme or deviant case sampling was chosen. This method is preferred for researchers containing efficiency of a single program, for example, of an in-service training program. To assess the efficiency of the in-service training program, the researcher composes the sampling of the participants having achieved high success in the training program, and the ones discarded due to their failure. Thus, the researcher obtains rich and detailed data about the efficiency of the program (Yıldırım ve Şimşek, 2011). In this research, all the teachers in the target population of the study who volunteered to share their views and criticisms about the program were included into sampling. The teachers who criticized the program are employed in various provinces. In this way, the sampling also has maximum variation

sampling method characteristics.

## Participants

The study group included 12 junior high school mathematics teachers selected by extreme or deviant case sampling from the population of teachers that participated in the aforementioned training activity. The views of each teacher's opinions were analyzed in-depth to determine the similar views among the teachers, and to reveal different dimensions of the problem. To keep the identities of the teachers confidential, the teachers were coded as "T1", "T2", "T3", "T4", etc. based on the interview order (Table 1). Among the teachers that participated in the study (N = 12), 4 were female (N = 4), eight were male (N = 8) and three were with graduate (N = 3), and the others were with undergraduate (N = 9) education. The professional seniority of the teachers varied between 5 and 17 years. The majority of teachers (N = 9) did not participate in an in-service training activity previously. All teachers were employed in different provinces. Teachers mostly (N = 4) chose to participate in this training via the in-service training application module found at Ministry Information Systems web site. A number of other teachers (N = 3) participated in this training due to the recommendation of their colleagues (N = 3), and three teachers due to the information provided by the related school administrations, one teacher learned about the training via an official letter and one teacher participated in the study due to a telephone call from the Provincial National Education Directorate

## Data collection instrument

A semi-structured interview form was used in the interviews conducted in the study. Furthermore, the course textbooks utilized in the in-service training process were used to increase the richness and credibility of the data within the scope of the document review. In the semi-structured interview form, three main questions were posed:

- (1) What are the expectations of mathematics teachers that participated in the in-service training?
- (2) What were the views of mathematics teachers on the training

process?

(3) What were the recommendations of mathematics teachers about the training process?

#### Data collection

All teachers that attended the seminar were informed by e-mail, and interview forms were sent to 12 teachers that volunteered to participate in the study. Written answers were received from the teachers and communication channels with the teachers were kept open to achieve more detailed and clear answers via telephone when necessary.

#### Data analysis

Qualitative data collected in the study were analyzed with descriptive analysis. "According to this approach, the data obtained are summarized and interpreted based on predetermined themes" (Yıldırım and Şimşek, 2008). After the study, data were coded separately by two researchers, a common code and theme list was formed by comparing the resulting code and theme lists. Then, all data were re-coded by both researchers based on the determined list. Statements that were considered to be used in direct quotations were identified and included in the findings section. Analyzes were also reviewed by a third colleague with experience and knowledge on the topic of investigation for consistency of the determined themes. Furthermore, the participants' approval about the obtained findings was obtained to improve the internal validity of the study. To keep the identities of the participants confidential, the teachers were coded as "T1" - "T12", based on the interview order.

### FINDINGS

#### Expectations of junior high school mathematics teachers that participated in the in-service training

Expectations of junior high school mathematics teachers that participated in the in-service training from the training are presented in Table 2. According to the views of the participants, the teachers mostly preferred to participate in this particular training to "learn different methods and techniques". Since the training activity was a "special instructional methods and techniques-mathematics" seminar, the aforementioned expectation was a priority for the teachers. This was followed by the desire "to see new places." Teachers stated that they preferred this particular training due to its location, and it was organized during the summer break. Participants considered "sharing knowledge and experience of the academics who are experts in their field" significant. The fact that course administrators were academicians and the participants' desire to learn new information from them and share their experiences were presented among the reasons for joining the seminar. On the other hand, certain participants stated that they hoped the seminar would contribute to "professional development" and their professional knowledge on the field. While certain participants expressed their expectation to learn practical information about "conducting practical activities", certain others stated that they expected to "share information

and experiences with colleagues".

#### Views of mathematics teachers on the in-service training process

Based on the participant opinions, the negative and positive views of mathematics teachers on in-service training process are presented Tables 3 and 4, respectively. Participants noted certain negative situations they experienced during the seminar as follows:

*The most negative aspect was "theoretical presentations and not enough practice" according to the participants.*

Teachers expressed their expectations that new methods and techniques should have been demonstrated in the classroom environment, but the instructions were predominantly theoretical. Several teachers also stated that "the seminar duration was short for the seminar content". The teachers observed that the seminar provided too much theoretical knowledge and expressed that either the content should be reduced or the duration should be extended. Teachers complained that "the seminar content was not well planned", and stated that they experienced an educational process which was mostly theoretical and the content should be improved with practical activities and to be laconic. Another negative opinion was that "the spaces where the seminar was organized were technically inadequate". They stated that especially in activities that required the use of computer laboratories, two or three teachers had to share a computer and that caused problems, and certain teachers stated that "there was a cleanliness problem in the accommodations". They claimed that beds and armchairs were very old, rooms were not cleaned daily, etc. Almost all of the participants considered "exchange of information with colleagues" as the most positive aspect of the training they attended. Teachers stated that they shared their experiences with colleagues from all over Turkey, and learned new things from them. Similarly, they mentioned "exchanging information with instructor professors in the training". They talked about the importance of having the opportunity to chat with academicians outside the class, and share their experience and knowledge. Furthermore, certain teachers stated that participating in the seminar refreshed their knowledge, while others mentioned that they acquired new information. Teachers indicated that they recalled certain theoretical information that they have learned during their undergraduate studies, learned about the new computer software like Geogebra, and obtained information about this software.

#### Recommendations of mathematics teachers on the in-service training process

Based on the participant opinions, recommendations of

**Table 2.** Expectations of junior high school mathematics teachers that participated in the in-service training.

Expectations	Participants	Sample statements
Opportunity to learn different methods and techniques	10 (T1, T2, T3, T5, T7, T8, T9, T10, T11, T12)	T8: "I was following the instructional methods and techniques in mathematics instruction after graduation from college. I thought the seminar would provide a more scientific experience"
Visiting new locations	7 (T1, T4, T5, T7, T10, T11, T12)	T7: "It is important for me to be some place where I can spend good time... I was expecting to see a new space, a new province. I had the chance to see the beautiful scenes and historical places around"
Sharing the knowledge and experiences of expert academicians	6 (T1, T4, T5, T6, T8, T12)	T1: "I was excited about the face to face training by college professors. I thought I could learn concrete methods that I could utilize in the class"
Conducting practical activities	6 (T1, T2, T3, T9, T11, T12)	T2: "When the training was over, I expected to lean more equipped techniques. I expected to come up with solutions that could be applied in actual situations we experience in the classroom"
Professional development	5 (T4, T7, T8, T10, T12)	T10: "I was interested in special instructional methods and techniques. I thought these would be beneficial to conduct better instruction"
Sharing information and experiences with colleagues	4 (T4, T5, T6, T12)	T6: "I thought it would be good opportunity to share information with colleagues who came from all corners of Turkey"

**Table 3.** Negative views of mathematics teachers on the in-service training process.

Negative views on the process	Participants	Sample statements
Presentations were mostly theoretical and were not sufficiently practiced	9 (T1, T2, T4, T5, T7, T8, T9, T11, T12)	T3: "In my opinion, I expected to find things I could apply in the classroom. What I observed in the seminar were the things I already conducted"
The duration of the seminar was too short for the content	8 (T2, T5, T6, T7, T8, T9, T10, T12)	T9: "The seminar content was current and adequate for the objective. However, the information was provided in a very short period of time. Instead, I would have preferred lesser number of topics should be instructed in more detail"
The content of the seminar is not well planned	6 (T2, T3, T5, T7, T11, T12)	T7: "Seminar content was current but not effective. Insufficient number of examples were provided. But when you think about it, maybe that was the only content that could be planned for that time period"
Technical inadequacies in the seminar spaces	6 (T1, T5, T7, T8, T9, T12)	T8: "...It was technically insufficient. Computer lab was inadequate. There was a projector but it was inadequate. In-Service Training Institutes should contain smart boards, etc"
Accommodation issues	6 (T5, T6, T7, T9, T10, T11)	T11: "They should pay more attention to cleanliness in the accommodations. For instance, the bed sheets and towels should be changed at least once every two days, if not every day"

**Table 4.** Positive views of mathematics teachers on the in-service training process.

Positive views on the process	Participants	Sample statements
Sharing information with colleagues	11 (T1, T2, T3, T4, T5, T6, T8, T9, T10, T11, T12)	T10: "The training was great. We got to discuss the problems we experienced in mathematics instruction with our colleagues who worked in other cities"
Sharing information with the professors who instructed the training	6 (T2, T4, T6, T8, T9, T12)	T9: "The professors were masters on the topic. They treated us as colleagues, not as students. This was a factor in the success of the training that lasted a short period of time. We were able to ask them all questions we wanted to ask. And they replied all sincerely"
Learning new information	4 (T4, T6, T7, T10)	T7: "I learned about the different programs used for computer-aided mathematics education... it was stimulating for the research I conducted later"
Refreshing old information	1 (T10)	T10: "We had the opportunity to remember the instructional methods and techniques utilized in math and observed the application areas"

mathematics teachers on the in-service training process are presented in Table 5. Participants made several recommendations. These recommendations could be listed as follows;

Teachers recommended inclusion of more practical activities, explanation of the application of the methods and techniques that were addressed theoretically in the classroom, consideration of physical facilities and their improvement to be suitable for seminars, improvement of technological equipment, particularly the computers, sharing preliminary information about the future seminars, providing not only the name of the seminar but information about the instructors, related methods and techniques before the seminar and during the application process, improved use of the material, availability of more material on mathematics education during the seminar, necessity of the availability of material associated with mathematics education in the seminar and information on how to use these material at schools, effective planning of content, planning to provide more practical and less amount of content for the teachers in a shorter period of time, inclusion of technology-assisted methods, information about new technology-assisted methods with the introduction of technology to education as a result of smart board, tablet, etc. use, sharing sample applications, sharing the practical applications teachers utilize in their classes with colleagues from all over Turkey, or to watch these applications via videos, sufficient content and time reserved for that content, instead of instructing more content in less time, planning the content with an approach that values quality rather than quantity, reducing number of participants, forming smaller groups in the seminar if technological equipment are insufficient, to continue the seminar with the same individuals, to achieve a more productive training, and the same group should be provided with a more qualified training at a

different time to sustain the education.

## RESULTS AND DISCUSSION

In-service training organized by the ministry for teachers is undoubtedly very important. The creativity and benefits of the in-service training are reduced if they are conducted without determining the needs and goals, and the requirements of the participants, and the outcomes will not be positive (Taymaz, 1981).

In a study conducted by MEB (2008), the in-service training requirements of mathematics teachers were attempted be determined. 62.3% of the 3.134 mathematics teachers who participated in that study expressed that they were in need of training in teaching strategies, methods and techniques in mathematics education, and 59.5% of the same teacher group needed training on mathematics program measurement, assessment methods and techniques. Thus, the in-service training activity that was the topic of the aforementioned study aimed to eliminate the problems of teachers related to teaching methods and techniques. However, findings of the present study indicated that the training did not adequately meet some of the expectations (conducting practical activities, learning different methods and techniques) of teachers.

Erdem et al. (2006) conducted a nationwide survey, and found that teachers did not consider themselves competent in using instructional methods. Yıldırım and Demir (2003) reported that teachers in primary and secondary schools use mostly lecture techniques in their classes, utilized problem solving, question-answer technique partially, and did not use presentation, sightseeing-observation, group discussions, case study, drama, brainstorming method and techniques sufficiently.

Also, in their study, Aribaş and Göktaş (2014)

**Table 5.** Recommendations of mathematics teachers on the in-service training process.

<b>Recommendations</b>	<b>Participants</b>	<b>Sample statements</b>
Applicable original activities	7 (T1, T2, T3, T4, T9, T10, T12)	T2: "In my opinion, seminars should not be planned with a 20-30 years old approach and more active, for examples methods where we could play with children should be developed and these should be unique and dynamic"
Consideration and improvement of physical facilities for seminars	5 (T7, T8, T9, T11, T12)	T9: "Number of computers we used for Geogebra application were quite insufficient. Several teachers were not able to use the application. For this purpose, technical and physical facilities should be improved"
Sharing preliminary information about the training	5 (T6, T7, T9, T11, T12)	T7: "Detailed information should be provided to the participants prior to training (who will make the presentation, what are the course topics, what are the prerequisites, what should we research to prep for the training...)"
Improvement of material use	5 (T4, T5, T8, T9, T12)	T8: "Material that could be used for mathematics instruction were inadequate. A set of mathematics course instructional material could be provided for these types of courses"
More effective planning of the content	4 (T2, T6, T7, T12)	T12: "The content should be less dense. More practical and applicable methods should be instructed to the teachers"
Inclusion of technology-supported methods	4 (T5, T8, T11, T12)	T11: "Instead of ordinary information and applications, investigation and presentation of really useful and practical techniques would be more productive. Simply, our classrooms are supported by technological arguments, I desire to attend trainings that would reflect these developments"
Sharing examples of well-done practices	3 (T1, T4, T12)	T1: "If the topics are instructed using methods and techniques that simulate the classroom conditions or visual material that reflect the application of other teachers who achieved positive outcomes are presented, it would be better"
Adequate content and time reserved for that content	3 (T8, T9, T12)	T9: "If the content is dense, the duration should be longer. In fact, instead of so much content, it would be better for us if less number of topics are addressed but in more detail"
Less number of participants	2 (T7, T10)	T10: "It would have been better if there were smaller groups, especially for the computer application"
Extending the same seminar with same individuals	1 (T8)	T8: "Special Instructional Methods and Techniques Seminar was generally positive and beneficial. The seminar could be extended with a second step where teachers who participated in the seminar could train other teachers in their regions"

demonstrated that mathematics teachers did not have adequate knowledge about new methods and techniques and that they do not have enough knowledge about new methods and techniques. In addition to that, they found that the teachers need more in-service training, however

previous trainings they attended did not satisfy their expectations. In short, similar studies demonstrated that teachers had inadequate knowledge on new methods and techniques and required in-service training, however they experienced certain problems with in-service training

programs they attended. In another study, Özen (2006) obtained similar findings and found that in-service training of primary school teachers was useful and necessary, however problems such as the theoretical nature of the instructions, the lack of or insufficient practical applications were experienced in in-service training.

In a study by Uçar and İpek (2006), it was found that administrators and teachers in elementary schools considered that in-service training was necessary but did not consider the in-service training programs in Turkish education system effective. In the present study, the perception of the teachers created by the training content, experienced problems and the technical facilities available in the training settings was also important. Because, these perceptions could affect the participation of the teachers to future trainings negatively.

The teachers who participated in the seminar were satisfied about the exchange of information with their colleagues and academicians, learning new and refreshing the old information during the seminar. These results were a part of the contributions provided by the in-service training for the teachers. After the study, participants provided several recommendations. Among these recommendations, the most frequently mentioned were the need for practical activities in in-service training programs.

In a study conducted by Saka et al. (2007), a practical seminar activity was organized for science teachers, and the authors attempted to determine whether there was a difference between the knowledge of teachers on instructional methods and techniques before the application and after the application while the data collected in that study demonstrated that the knowledge levels of participating teachers significantly improved after the seminar. Because, the authors initially provided theoretical information on the instructional methods and techniques, and the constructivist approach to the participants of the in-service training, however, this was followed by practical activities. During the application process, the authors monitored the work and provided feedback for the teachers about their mistakes.

In the study conducted by Önen et al. (2009), they attempted to determine whether there was a significant difference between methodological-technical knowledge of Anatolian Teacher High School teachers that participated in in-service training before and after the training, and it was determined that methodological-technical knowledge and knowledge on constructivist approach of the teachers improved significantly after the training. This and similar research results demonstrated that practical and well-planned in-service training activities instructed by experts could be very beneficial.

The in-service training content should be renewed and more qualified training settings should be created based on the findings of the present and other studies conducted on the field and the recommendations of the teachers. Furthermore, it was further observed that the

studies conducted on mathematics teachers in the field were rather limited. It could be argued that there is a need for further studies, especially on evaluating the quality of in-service training.

The participant teachers mostly complained that the activities were mostly theoretical and lacked application activities. Kanlı and Yağbasan (2001) as well found that the participants in an in-service training program for physics teacher pointed out that they could not perform the experiments in the program in their own schools. They also added the most significant outcome of the in-service training programs was the opportunity of exchanging their experiences with the teachers from various districts of Turkey. Teachers participating in the program suggested the activities should be more application-oriented, and more math-teaching materials should be used.

## RECOMMENDATIONS

Teacher expectation from the in-service training program and their views differed widely. Some teachers, for example, pointed out that they had participated in the program hoping to learn some new methods and techniques to employ in mathematics teaching, but found the content of the program not organized well, hence, did not serve the purpose. However, they appreciated the opportunity of exchanging views with their colleagues, visiting new places at the end of the program. Following suggestions were developed in the light of the results of the research;

- (1) The skills to be acquired through the programs should not be limited with the theoretical ones but be in company with their applications.
- (2) In-service training programs should be designed in accordance with the teachers' needs.
- (3) In-service training programs should be long enough.
- (4) The content of in-service training programs should be updated.
- (5) Application opportunity and environments should be offered to the participants congruent with the content of the program. The facilities allotted to these kind of activities should be renewed and technically updated.
- (6) Professional development of the teachers participating in-service training programs should be monitored and supported.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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