

Implementation of an Action Research Course Program for Science Teachers: A Case for Turkey

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The purpose of this study was to introduce an AR approach to a group of science teachers during an in-service AR course program and learn its contributions to their professional development. Data were gathered through an AR project by working with a group of eight science teachers throughout a four-week period. In the content of the course, knowledge on educational research was given to teachers and then the participants were encouraged to conduct small-scale AR projects. During this process, it was found that project teachers willingly participated in all the meetings, embracing the views of doing research based on their own classroom environments, making these research results public, gaining reputation, and increasing the quality of their own practices. Key Words: Science Education, Action Research, Professional Development, and In-service Program

Introduction

The differences between technical and reflective reasoning approaches in teacher education have been discussed by some educators (Altrichter, Posch, & Somekh, 1993; Lieberman & Miller, 1991; Schön, 1983; Tubbs, 2000). In technical reasoning, teachers are seen as technicians who just follow the directions of outsiders such as central governments, teacher educators, and administrators in schools. However, in reflective reasoning, teachers are able to develop many authentic and effective methods to be taken into consideration by other people, such as colleagues, teacher educators, and policy makers (Sweeney, Bula, & Cornett, 2001; Van Driel, Beijaard, & Verloop, 2001). Technical rationality follows three basic assumptions which are classified as the following: (1) there are general solutions to practical problems, (2) these solutions can be found outside of practical situations, and (3) the solutions can be disseminated to teachers by means of publications, in-service training, and administrative orders. On the other hand, reflective rationality follows three assumptions which are: (1) complex practical problems demand specific solutions, (2) these solutions can be developed only inside the context in which the problems arise; teachers act as critics and decision makers, and (3) the solutions cannot be successfully applied to other contexts; they can be made accessible to other teachers as only hypotheses to be tested in their own contexts (Altrichter et al., 1993; Schön, 1983).

Quality teaching requires more practical and reflective reasoning. It has been discussed that teachers who look at their teaching practices closely are able to be more aware of their own practices, the differences between their beliefs and practices, and of how exactly their students are thinking, feeling, and learning in educational contexts

(Halliday, 1998; Tabachnick & Zeichner, 1999; Tubbs, 2000) In this way, reflective teachers may develop individual practical knowledge and theories (Sweeney et al., 2001; Van Driel et al., 2001). However, unlike most of the research reports constructed, investigated, and published by academicians, teachers' reflective processes are rarely observable to the others (Hollingsworth, 1994).

Reflective teaching is action research (Carr & Kemmis, 1986), and reflection is the basic element of the AR (Loftus, 1999). The aim of AR is to initiate change by enhancing critical self-reflection through an examination of one's assumptions, practices, and political context (Christenson et al., 2002). It helps teachers to become more aware of the personal practical theories that underlie their teaching practices. Whitehead (1999) draws attention to the development of living educational theories, which are grounded in the lives of teachers at work. There is an enormous relation between research and teaching. Effective teacher development involves encouraging teacher initiative and helping teachers to find their own solutions to their teaching problems (Holloway & Long, 1998).

Separating teaching from research creates problems in using research results in order to improve teaching (Elliott, 1991; Hancock, 1997). Teachers should be reflective practitioners and act as researchers in their own classrooms (Bell, 1989; Hopkins, 1985; Loftus, 1999; Price, 2001; Schön, 1983; Stenhouse, 1975; Whitehead, 1999). Reflective teaching includes teachers' sharing ideas, listening and reacting to the colleagues' ideas, and trying to integrate these ideas into their thinking (Zeichner & Liston, 1996). In such a process, teachers are able to learn a series of practical knowledge from each other. However, teachers can not find enough time to discuss their experiences, beliefs, and individual teaching theories about teaching-learning processes with each other, within their daily lives (Halliday, 1998; Hollingsworth, 1994). Nevertheless, AR has a rich potential to empower teachers and lead to changes in teaching practices (Christenson et al., 2002).

It is known that the AR approach entered into the educational area after the Second World War (Feldman, 1994; Lieberman & Miller, 1991). In this context researchers from different social areas have investigated some ways to obtain social science knowledge to be more aware of the significant social problems of the community (Kapler, 1997). Lawrence Stenhouse identified the concept of teacher-as-researcher as part of his own liberal view of education and played an important role in this movement (Stenhouse, 1975). Since then this movement has become more important and gained different forms and names in the related literature (Rearick & Feldman, 1999).

Teacher education programs based on the reflective practitioner model were re-organized around the idea that teachers were able to identify and solve their problems through systematic analysis of their practices (Price, 2001; Somekh, 1995, as cited in Halliday, 1998; Valli, 2000). Project courses have been provided for teacher education programs (Gitlin, Barlow, Burbank, Kauchak, & Stevens, 1999; Keating, Diaz-Greenberg, Baldwin, & Thousand, 1998). In addition, this concept has been introduced to teachers at work by the help of in-service courses, seminars, and research projects. Teachers have constructed their own research projects individually and published these in teacher research or electronic journals of education. They have also worked with their colleagues in groups and engaged in collaborative action research (Feldman, 1992; Nind, 1997). Pre-service and in-service courses, experiences gained through student teaching

practices, written materials, and professional publications play an important role in teachers' learning. However, professional knowledge about teaching science develops not only from reading the materials, but also through informal and formal exchanges among science teachers during meetings of research associations (Feldman, 1992; Holloway & Long, 1998).

AR Movement in Turkey

The numbers of educational research projects have gained more impetus in the last decade in Turkey, especially, after the re-structuring of the faculties of education in 1997, which changed the missions of these faculties (Ayas, Çepni, & Akdeniz, 1993). Since then many studies related to different areas such as program development, teacher education, concept learning, computer-based instruction, and scientific-literacy have been encountered in the Turkish educational research literature. However, collaborative research between educational researchers and teachers, and using AR approaches has been ignored. In conjunction with this, teachers have not been actively involved in the research processes; educational researchers have only used teachers' views and opinions for the purpose of data gathering, and thus teachers' systematic research about their own classroom or school practices have not been made important. However, teachers should work in all phases of the research processes (McNiff, 1995). According to Çepni, Küçük, and Bacanak (2001) teachers neither do their own investigations nor do they benefit from academic research reports on their practices. Consequently, most of the teachers do not see research as part of their roles, and teachers' communities do not embrace a research-based tradition (Ayas, 1993; Baki, 1994; Çepni, 1993; Geban, Çiçek, Başaran, Demirbaş, & Maden, 2001). It is well known that most of the studies based on university contexts are very abstract and far from the classroom practices of teachers (Kosnik & Beck, 2000; Sachs, 1999). This idea is also valid for the Turkish context.

The AR movement has currently been launched into education in Turkey. In the Turkish educational literature it can be seen that some educators are writing more about it and are encouraging student teachers and practicing teachers to follow this contemporary approach (Akdeniz, 1993; Çepni & Akdeniz, 1996; Gürşimşek, 1998; Onel, 1997). In addition, some articles on the AR approach were translated into the Turkish language and published in commonly read journals in order to make the teacher community aware of these issues (Köklü, 1999). Only one book has been written that includes some sections on AR approach with sample studies since 2001 (Çepni, 2001). In addition, an educational symposium called *Science Education at the Beginning of the 21st. Century* was organized at the University of Maltepe in Istanbul. For this meeting academics and 300 teachers from science departments were invited. At the symposium the potential role of AR in science teacher education was discussed, teaching not seen as a research-based profession in Turkey was criticized, and it was suggested that some AR projects should be organized (Çepni, Küçük, & Bacanak, 2001). Knowledge about educational research should be provided for all teachers and they should be an important element of the educational research processes. In this way, the numbers of reflective teachers and the quality of educational research reports will be increased and a research community developed.

The purpose of this study is to learn in-service science teachers' thinking and impressions on research in education and to demonstrate AR during an in service AR course program and discuss its contributions to their professional development.

Research Methods

The present study employed qualitative methodologies. "By qualitative methodology we mean approaches that enable researchers to learn first hand about the social world they are investigating, by means of involvement and participation in that world through a focus upon what individual actors say and do" (Hitchcock & Hughes, 1995, p. 12). Strauss and Corbin (1990) defined qualitative research as "any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification" (p.17) and instead "the kind of research that produces findings arrived from real-world settings" (Golafshani, 2003, p. 600). Thus, we used participant observation and semi-structured interviews for qualitative data, which is one of the most demanding (Hitchcock & Hughes, 1995). In this article, thus, we examined a group of science teachers' perceptions and experiences on educational research. To introduce the concept of AR to science teachers at work, an AR course program that emphasizes teachers as critical consumers of research and especially doing AR (Gitlin et al., 1999) was constructed and implemented with eight science teachers from different primary schools as an in-service course. All participants were male and their professional experiences ranged from 7 to 25 years. We invited them to take part in this project group for a four-week period in order to learn action research method. It was called the *Science Teachers AR Group* (STARG). There was a similar AR group of eight physics teachers named *Physics Teachers AR Group* (PTARG) in England (Feldman, 1992). We conducted semi-structured interviews with the sample at the beginning of the course program. During these interviews, the following questions were asked in order to describe the teachers' thoughts about research and expectations from the course: *What is education research? Who does research? How do you use research in your practice? Can teacher also act as a researcher? and What are your thoughts and expectations about the course?* We also systematically examined their views about the course program and how the course influenced their attitudes and understanding of research. The participants' reflections through the course program were gathered with the help of participant observations and individual interviews that were conducted, project teachers' diaries, and our own reflective notes that were taken after each session (Price, 2001; Tabachnick & Zeichner, 1999; Valli, 2000). The semi-structured interviews, all the informal interviews among the participants, and also the individual interviews with the instructor were taped and transcribed. The transcripts were the primary data source for this study.

All data were analyzed for convergence based on Mathison's (1988) triangulation method. Firstly, we read and reread all the transcripts and tried to see the similar, contradictory, and independent viewpoints and in this way developed some data analysis categories. The data were grouped according to the categories and interpreted in light of this AR project's overall focus on teacher learning and especially doing AR. While analyzing data related to the course program, the categories (i.e., relation between research and reflection, self-confidence about doing research, notice of self-abilities,

collaboration in doing AR, changing teaching practices, and concern to making research public) were especially taken into consideration.

Charting the Course

Some courses, which emphasize teachers conducting AR and becoming critical consumers of research reports, were already developed and implemented for practicing and student teachers (Gitlin et al., 1999; Nind, 1997; Price, 2001). In this study we provided an in-service AR course for science teachers, which intended to enrich their knowledge about research practices so that they may conduct small-scale action research in their classrooms and school contexts. The principal purpose of the organized course was to inform science teachers of the AR method and to encourage them to plan and conduct research projects based on their own learning-teaching problems. Through the course, AR was introduced to participants as a form of systematic and self-reflective examination done by teachers about their own practices. In this context, the aim of AR is to improve teaching-learning practices by understanding them more fully and improving the contexts in which practices are done. Taking into account AR's aims (Altrichter et al., 1993), the present course's aims were introduced as the following:

1. To develop and improve the participants' practices.
2. To develop the participants' knowledge and practical understanding.
3. To develop teachers' professional knowledge as a whole.
4. To develop and improve the education as a discipline.

Topics included in the course content stressed that AR was not only an individual, but also a participatory effort. In this context, the content of the course program was developed, by using the topic titles in a book written by Altrichter, Posch, and Somekh (1993) called *Teachers Investigate Their Work*. During the course the following subjects were introduced and discussed in detail: the teacher research diary in AR, finding a starting point for teachers' own research, clarifying the starting point of the research, data collection, data analysis, developing action strategies and putting them into practice, and making teachers' knowledge public. Course program and activities are presented in detail in the Appendix. The overall structure of the course was designed to emphasize the importance of collaboration in doing AR (Christenson et al., 2002). The course was implemented within a four-week period and for a total of twenty-four hours at the Teacher House¹. Project teachers would come together two times each week and every meeting lasted between two and four hours. In addition, handouts of the subsequent session were given to the project teachers so they could discuss them in each meeting along with their written reflections from their reflective journals. A mini-AR proposal was the main assignment for the course. Project teachers shared the drafts of their proposals, helped each other in developing their questions, designing research, and collecting data. Some educational articles written by academics were also provided to the project teachers and some AR reports were translated into the Turkish language for them.

¹ A place where teachers usually spent their leisure time and discussed educational problems with each other; almost every city and town has at least one.

Teaching Methods of the Course Program

In the determination of teaching methods of the course, an AR course organized by Feldman (2000) with student teachers was examined at first and its teaching methods were used in a large scale. The steps were as follows:

1. In the implementation phase written materials of the topics taught for each week were critically examined in the group and discussed by the participants. Topics for the next meeting were provided to the participants and they were encouraged to come to the next meeting ready to discuss critical ideas about their experiences. In addition, participants recorded their reflections in their research notebooks.
2. Each participant determined a problem based on his own classroom practices and in following, prepared a mini written report about how the problem might be important for the other group members. This report included teachers' experiences and also related studies' results in the same area. Each participant presented his own report to the other group members and these reports were given feedback.
3. Each participant recorded his research experiences regularly into his research notebook. The aim of research notebooks was to provide teachers an opportunity to think more about their works by developing new ideas for their teaching. In this way, they could make changes in practices and assess the results. In addition, participants used these notebooks as a data source to analyze AR projects.
4. Through the course program participants were provided with some AR project reports prepared by student teachers and articles written by science educators. The teachers were encouraged to make critical reflections on them.
5. Each participant prepared a two to three page draft project proposal related to his own investigated topic. The researchers and other group members exchanged feedback on these drafts and in this way the last form of the drafts were established.
6. Under the guidance of the course instructors each participant planned a four to six page report on his AR projects and presented it to his colleagues in a mini symposium or seminar six months after the course ended.

Findings

Initial Interview Findings with Science Teachers

Four questions about the teachers' perceptions on research and one question about their expectations from the course were asked of each participant science teacher before the course program started. Findings of the interview data are presented below.

1. What is educational research?

Before becoming involved in the course most of the teachers viewed research as a practical and technical matter. In their views, educational research tries to find solutions to issues of teaching and learning process. For them, research results provide some suggestions to increase the quality of educational practices at schools. One teacher explained this theme by defining research as: "It determines and solves the encountered

problems at the learning and teaching processes of science courses.” Another teacher explained: “Observations done in the classroom to determine more effective methods implemented in science courses.”

Some of them also described research as being aware of the current philosophies and teaching techniques and felt that research was library oriented. One teacher stated: “Whenever I hear about a new technique, teaching method, or see something different another teacher has done, I try to have more knowledge about it through books.”

2. Who does educational research?

Most of the teachers believed that academics from universities and experts from the National Ministry of Education (NME) implement educational research (the Turkish Education System is highly centralized under the legal authority of National Ministry of Education). However, two views were different from the others. These two replied: “Educational research can be done both by educational researchers and volunteered teachers in schools.”

All teachers stressed that academics only used teachers’ ideas as data sources and neglected teachers for other parts of the research process. Lack of collaboration between teachers and academics was stressed as the basic concern, which leads to teachers not using academic research in the teaching-learning process.

3. How do you use research in your practice?

Interview results clarified that the teachers did not use educational research results in their practices. They thought that a great deal of educational research was written in a particular style and suitable for only the world of academics. Teachers have little time and no easy access to find educational research. One held this view: “Educational research is implemented by academics and it is written in a different style. Sometimes it uses more statistical methods and this makes it too difficult to understand for teachers.”

Although the National Ministry of Education (NME) implements some kinds of research and disseminates these research results all over the schools, teachers believed that the directions and recommendations coming from the NME would not work in their typical contexts efficiently. A teacher with 25 years of experience claimed that: “I don’t see educational researches practical for our context, because the sample groups do not include the basic characteristics of my contexts.”

4. Can a teacher also act as a researcher?

The majority of the participants did not think that they could act as researchers and do small-scale studies in their classrooms. However, they stressed that science teachers need to examine new sources of subject matter because of the changeable nature of science courses. Two of them thought that being a researcher is required just to look at the sources of the subject matter. One of them replied: “I like to search new knowledge and look at the sources to increase the quality of my courses.”

Some of the participants also explained that the National Ministry of Education sometimes requests reports on educational problems from teachers. Although they honor

these requests, they thought that the officials from the National Ministry of Education did not take the reports they prepared into consideration. For teachers, the fundamental problem underlined in using and making small-scale projects in school contexts is the lack of time, no support from the school administration, and financial matters.

5. What are your thoughts and expectations about the course program?

The AR course has been the first experience for the teachers in designing educational research. Most of the participants held the view that, as in other in-service courses, they would be informed about new research approaches on learning-teaching processes in science education. Two of them added that they would do research together and make comments on a specific teaching-learning problem under the guidance of the course instructor. They joined into the course with the following beliefs. One pointed out that:

I have some prejudice about the in-service programs. However, my fundamental expectation from the program is to reach new knowledge on educational researches. I think this program will contribute to development of my professional knowledge, thus, I have joined into this course willingly.

Another teacher who has twenty-five years experience clarified his views as: “I think we will be informed about how teachers work in other countries and how to reach and benefit from researches.”

On the other hand, after we briefly explained the course content, the participants all stressed that working collaboratively in this kind of course would contribute to many areas of their professional life. They perceived that the research process included more complex activities for teachers. However, they commented that it was a good opportunity to do systematic studies around their own practices. They all agreed on making their professional knowledge and experiences public for others and were open to discussion. They also thought that this new initiative would make a contribution to more practical and quality educational research for other teachers who work with different contexts.

Initial interview results about educational research

Interview results show that all science teachers are partially aware of the concept of educational research. This is because of the fact that knowledge in science courses is usually based on research results and experiments. Therefore, due to the nature of scientific knowledge, science teachers have more advantages than others. However, most of the teachers were not familiar with teachers doing their research and did not see themselves as researchers. However, these interviewed science teachers were all willing to do their own research in their classrooms and school contexts as long as the research activities did not affect their teaching practices negatively and educational researchers from universities provided adequate support. On the other hand, the science teachers clarified that the lack of interaction between the university environment and the science teachers' resulted in the lack of awareness of each other's activities and issues. This

situation leads to teachers' developing negative attitudes. For example, teachers think that educational researches are not concerned with teachers' classroom practices and research results do not provide much support for teachers' practices.

Implementation and Discussion of the Course Program

Relation between research and reflection

Through the four-week course all participants willingly took part in all meetings. From the first group meeting data it was clear that the participants did not find a close relationship between reflections on their classroom practices and implementation of small-scale research activities. They thought they had already been doing some reflections during their teaching practices and still believed that research activities implemented by practicing teachers in the classroom were seen as only practical reflections, not a part of a research process. Plus, they perceived research as something especially done by academics at the university contexts with more knowledge and status, which is also supported by Nind (1997).

In order to overcome these presumptions, as course instructors, we explained that teacher-research is mostly about their real classroom practices and obtained results would be more useful than other type of researches for teachers. It was also stressed that teacher-research is based on specific contexts and aimed at increasing the quality of teachers' own practices rather than for all educational situations which are different from each other. After a few sessions they realized that traditional reflection was different from critical reflections and teacher research required systematic reflections. As an example of this we can state an explanation made by one of the teachers:

I have always done some reflections through my classroom teaching but I have learned that systematical reflection needs to looking at the phenomena occurring in the classroom or school contexts more closely...I think systematical reflection is the first step of an AR.

Self-confidence about doing research

Although the project teachers were provided with detailed information on teacher research, that is, how to plan and organize their AR projects during the program, they sometimes felt that they were not capable of doing AR in their classrooms. In addition, they did not think that they were able to follow the research activities successfully, such as determining a researchable question in the classroom, selecting useful methods to gather data, analyzing data, and especially writing research reports. The following statement made by a teacher might be considered an example: "Although I have had the knowledge to do research through the course program, I realized that I have not enough self-confidence yet to start my AR project. I have not also decided on an issue, which needed more attention."

Notice of self-abilities

During the course, the project teachers opened their individual classroom practices to discussion and in this process they tried to develop their own research questions and create their own research plans. Looking at their project subjects closely it was realized that they were concerned with similar issues. These include the reasons for students' low achievement on science courses, student-teacher interaction, students' attitudes towards science courses, planning effective group work, and developing usable activities in science teaching. In some cases, teachers tried to justify their action strategies by referring to some written materials they read. To solidify this we would like to give another teacher's revelation: "...I had some important knowledge on what the new approaches in science education are...I found opportunity to meet new ones from the profession, interact with them and to cross-change our professional knowledge, individual science teaching practices and theories."

Collaboration in doing AR

Through the informal interviews it was concluded that project teachers enjoyed being together and sharing ideas with each other and they expressed a sense of professionalism from involvement in these kinds of courses. Teachers' reflections taken for each meeting (group members were encouraged to keep journals) showed that they valued the group work very much. They also expressed that for a teacher to become involved in a collaborative AR group and to communicate, discuss and share ideas, and make judgments with the other participants, could result in changing teaching practices. Project teachers began to describe themselves as the members of a distinguished collaborative group, *Science Teachers AR Group* (STARG). According to Holloway and Long (1998), collaborative-shared practice group provides an environment that encourages learning process, which might not otherwise occur: "...I want to thank everybody, because we have performed a good working group. I also expect to work with these group members in other project."

...Course program firstly showed me that I need to make a good observation and helped me to see the inadequacies in my practice. I have started to look at my classroom practices in a reflective and critical way and surprised that most of the students in my classroom have negative attitudes towards science courses. I think they might be changed in a positive way and achievement level of them can be increased.

Changing teaching practices

Teacher-research is based on the idea of teachers as reflective professionals who are concerned and prepared to change their practice in light of interpretations and experiences (Holloway & Long, 1998). We have seen from the STARG teachers that suggestions of the members have been taken into consideration and implemented seriously by others. For example, assessing students with the help of high-level questions gained more attention, so, before the school examinations project teachers discussed the

questions that would be asked and the results of the test were critically examined. In addition, project teachers developed their practices by changing their teaching approaches based on the information gleaned from their projects.

“I am beginning to realize that collaboration with or among the colleagues is a crucial element of AR.”

“...In spite of some difficulties we encountered during this program, it contributed to our professional development and helped us to cope with the problems of our practices.”

Concern of making research public

When the four-week active teaching period of the course ended the project teachers did not seem to have self-confidence in constructing a platform to make their own professional experiences public for other colleagues. Project teachers wanted to be supported by the school administration, colleagues who work at the same schools with them, and the university staff in the process of doing research. Eventually, they did agree on making their knowledge public.

I have had some theoretical and technical knowledge of the AR and how teachers work in the other countries...I know that there are many science teachers, who are very keen on their professions, have important individual theories, which should be disseminated to other professionals. I think AR is the best way of achieving this.

I don't think our studies will be supported by our administration and any other institutions but, I know it can be useful not only for us but also for other professionals.

Project teachers presented a small part of their own research proposals to the group. One of these, conducted by Erdem a participant of the course, is discussed below. By the end of the four-week course program all teachers turned in written pieces of research in progress that answered their own questions, from their own theories, as they actively constructed their own research papers. In this process we realized that they learned a little about research design, but they were still weak at writing about their classroom practices.

Like PTARG members, STARG members have continued to come together once a month. Based on the informal interviews with the participants it is understood that they are struggling with their project works and we should try to help them in constructing their AR projects.

The Case for Erdem

The most important phase of this course program was each participant's AR project proposal of two to three pages based on the individually chosen topics and an oral presentation to the group. Participants prepared their draft proposals at the end of the course program's third week. Then, these drafts were briefly presented to other group

members and feedback was exchanged. Participants' research projects were based on the areas of student learning, factors affecting the lack of students' success, the role of student-teacher interaction in science learning, in-service education activities based on school contexts, and a cooperative working model for science students.

In this section, we will discuss the case for one of the participants. Erdem signed up for this course reluctantly. His research problem examined the factors that contribute to a lack of student success in science courses. He wrote his reasons based on the related literature:

I decided to research important factors, which seem to be effective for my students not to be successful in science courses. Because, most of the students in my classes like the others are not as much successful as I aimed, unsuccessful students' numbers tend to increase; students are not concerned at science courses. I think these are the most important issues that need to be investigated.

In AR, a teacher's self-determination of his/her own problems is quite important (Cohen & Manion, 1994; Hollingsworth, 1994). Erdem believed that solving this issue would increase the quality of his practices and be useful for his students' effective learning. A teacher researcher who believes that his/her research will contribute to his/her classroom practices increases his work quality and allows self-study on it with more dedication (Altrichter et al., 1993). Erdem started to think about what causes students not to be successful in science courses and he started to think about if he was a good teacher for students' learning science. Thus Erdem started to analyze his practices from critical viewpoints and to execute reflective teaching practices (Barksdale-Ladd, Draper, King, Oropallo, & Radencich, 2001).

Having examined the project method, Erdem had planned to interview students in his classroom, teachers in his school, and also to learn students' ideas about the problem. In this way an effective interaction was taking place between students and teacher based on cooperation and would contribute to the solution of the problem by increasing students' academic achievement (Carin & Sund, 1989). Erdem's plan to interview the other teachers in his school showed that he understood that teachers exchanging their ideas are a critical part of AR. This understanding may contribute to establishing a research culture in school contexts. When this project ended it was believed that Erdem will have enhanced his teaching practices or changed them with new ones and his students' success would increase significantly.

Conclusions and Implications

The AR approach was introduced to practicing teachers by means of a four weeks course program (Christenson et al., 2002). At the beginning of this project the participants were interviewed about the ways in which they have made use of educational research. It was concluded that they thought educational studies were not collaborative endeavors, not easily accessible to teachers, and that the studies they read did not have much to contribute to their classroom practices. It became more apparent why teachers

reject many well-established forms of research, which could inform their daily decision-making (Gitlin et al., 1999).

As we were analyzing the data collected during the AR course program we wondered about whether the project teachers were continuing their own research after they left the course. The last interview data indicated that seven teachers were “planning to do” their AR projects. We began to follow up with telephone calls and by visiting these teachers six months after the course and were able to obtain follow-up data on six of them. One who works in a village school had not been reached. Of the six teachers, only two were fully implementing their AR projects. The other four teachers were planning to implement their research later in the year. Those who were not doing their AR projects gave the following reasons: time constraints (this was mentioned as the primary obstacle by all of them); commitments outside of the classroom such as professional activities; lack of support and criticism by administrators, colleagues, and also educational researchers; and difficulties in scheduling activities during the day because of full or inconsistent classroom schedules. These results are also parallel to the study done by Christenson and his colleagues (2002).

A significant source of teachers’ knowledge is formed in the exchange processes (Feldman, 1992; Holloway & Long, 1998); therefore, teachers’ interaction with their colleagues should be given more importance. Collaboration as a crucial element of reflective practice between group and within group (i.e., teacher-teachers, teachers-outsiders) may create a research culture in schools (Valli, 2000). For example, while STARG members have been implementing their AR projects in their schools, they have asked for their colleagues’ ideas about their research problems and in this context they have usually visited their colleagues’ classrooms to observe their teaching practices closely. They also have participated in collaborative work during their visits. In this way some projects, which could improve the schools, might be developed. By using these school development projects teachers at work could develop their teaching practices, use new technological materials, or learn new approaches on learning and teaching by themselves (Loftus, 1999). According to Nind (1997), not only student teachers but also practicing teachers should put themselves and their research proposals forward. In addition effective research papers might be produced and disseminated to other teachers by the help of in-service courses, seminars, mini-conferences, or teacher research publishing. From this viewpoint, this AR project is accepted as a good catalyst in which it is expected that more research papers will be produced that other teachers will find relevant and informative for working more effectively.

In sum this AR course was designed for only in-service science teachers, which might be accepted successful in some areas. Except for one teacher (who left the group at an early stage), all others have gained more educational research knowledge and planned to do their own action research. In addition, they have started to do reflective teaching. In this processes they have learned some important knowledge and have become more aware of their own individual educational theories. Hence, they have started to disseminate these theories to the other teachers in their schools. However, the dissemination of STARG findings to outsiders (i.e., teachers from other schools, policy-makers, and academics) has become a crucial issue. In the process of disseminating the research papers to people, STARG members and the instructor have tried to set up a mini-AR conference or series of seminars. It is suggested that these kinds of courses

should be expanded to all the teachers of the country so that they may be supported with required materials, pedagogic content knowledge (Shulman, 1987), and financial support. This article puts forward that if we - as educational researchers- want our studies to be useful for in service science teachers' professional development we need to make more collaborative studies with teachers, thus, we need to support them to do their own action researches in their schools.

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Appendix

Content of the Action Research Course Program

program	time	topics	activities
1. week	2 hours	<ul style="list-style-type: none"> ➤ Research and educational research concepts. ➤ Action research method ➤ Role of research diary in action research 	<ul style="list-style-type: none"> ➤ Writing research questions. ➤ Participants' daily writings
	4 hours	<ul style="list-style-type: none"> ➤ Nature of action research ➤ Finding a starting point about research ➤ Individual brainstorm method ➤ Explanation of the starting point about the research 	<ul style="list-style-type: none"> ➤ Implementation of individual brainstorm method ➤ Determination of their own action research topics ➤ Participants' daily writings
2. week	4+4 hours	<ul style="list-style-type: none"> ➤ Importance of data gathering ➤ Data gathering methods <ol style="list-style-type: none"> 1. Observation 2. Interview 3. Questionnaire 4. Triangulation method 	<ul style="list-style-type: none"> ➤ Starting to do observation ➤ Participants' daily writings
3. week	2 hours	<ul style="list-style-type: none"> ➤ Analyzing data ➤ Constructed methods of data analysis ➤ Critical methods of data analysis 	<ul style="list-style-type: none"> ➤ Holding data summary ➤ Developing categories and code data ➤ Writing theoretical notes ➤ Testing findings ➤ Participants' daily writings
	4 hours	<ul style="list-style-type: none"> ➤ Developing action strategies and putting these into practice ➤ Finding an appropriate action strategy ➤ Planning concrete steps related to action strategies ➤ Control of action research results and record gained experiences 	<ul style="list-style-type: none"> ➤ Crosscheck of alternative action strategies ➤ Presentation of the action research proposals ➤ Participants' daily writings
4. week	4 hours	<ul style="list-style-type: none"> ➤ Making teachers' experiences public ➤ Role of research reports in making teachers experiences public 	<ul style="list-style-type: none"> ➤ Research reports ➤ Participants' daily writings ➤ Last interviews with the participants' reflections about the action course program.

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This study offers a case for a far more rigorous investigation that has been possible in such a small-scale effort but we hope that the material here offers something of which to the debate on teacher development and school improvement. Here, we want to thank to the participants who joined into this course program.

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