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ADVANTAGES AND DISADVANTAGES OF SOCIOSCIENTIFIC ISSUE-BASED INSTRUCTION IN SCIENCE CLASSROOMS

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Abstract

The social roles and responsibilities expected from citizens are increasing due to changing global living conditions. Science education is expected to prepare conscious and sensitive students because today's students are the adults of the future. To do so, the main pre-requisite is quality teacher education. In the past decade, one of the most important research fields of science education has become socioscientific issues. The purpose of this research is to explore advantages and disadvantages of socioscientific issue based instruction in science classrooms according to prospective science teachers' views. A qualitative single case study design has been utilized. Prospective science teachers' diaries and focus group interviews were used as data collection tools. Dolphinariums, Kyoto Protocol, genetically modified organisms, recyclable black bags' benefits and damages, genetic tests, alternative energy sources and organ donation are examples of socioscientific issues, which are taught through activities in special teaching course. Findings of the study show that the advantages of socioscientific issue based instruction in science classroom are comprised of six sub themes that are upskilling, social awareness, development of thinking, meaningful learning, character and professional development, contribution to scientific literacy whereas disadvantages of this instruction process are challenges to teachers and students, limitations of teaching and learning process in prospective science teachers' perspectives.

Keywords: Science Education, Socioscientific Issues, Prospective Science Teachers

1. Introduction

The rapid development of science and technology has caused the emergence of varied socioscientific issues affecting almost every field of human life (Lee, Abd-El-Khalick & Choi, 2010). Socioscientific issues are science-based dilemmas. Occasional news on Turkish media like construction of nuclear power plant, importation of genetically modified seeds, legal practice on antibiotic use, and prohibition on abortion can be assumed among the socioscientific issues. People frequently witness debates on socioscientific issues on media (newspaper, radio, TV, internet, etc.). However, such media tools give prominence to sensational, contradictive, and questionable parts of the socioscientific issues (Reis & Galvão, 2004). Thus, many tend to have a decision and take a position on such issues. For example, recently, in the province of Artvin in the Black Sea region of Turkey, the establishment Cerrattepe Mining operating plant projects has been planned. However, this project has caused the reaction of many activists and local people. The media has shared the sensational aspects of these actions. All citizens should have the right to participate in all socioscientific decisions such as the establishment of Cerrattepe mining operating plant that has potential to affect entire society (Cansız & Cansız, 2016).

One of the ways to prevent people from having wrong decisions and arguments on socioscientific issues is to handle them within the formal science education. Attitudes and understandings towards rights and freedoms within the scope of personal, social, political,

cultural and economic dimensions are acquired in science lessons addressing socioscientific issues (Doğanay & Öztürk, 2017). Indeed, many researchers emphasize that arguments on socioscientific issues should be considered as one of the primary goals of science education (Kolsto, 2001; Zeidler, Walker, Ackett & Simmons, 2002; Zohar & Nemet, 2002). Along with this, socioscientific issues have been a substantial part of science education reforms and curriculums in all over the world (Hofstein, Eilks & Bybee, 2011).

It is well underlined that focusing on the socioscientific dimension of science helps students not only to improve argumentation and reasoning skills but also to develop perception of the nature of science and social awareness (Cross & Price, 1996; Dawson & Venville, 2009; Sadler, Chambers & Zeidler, 2004; Venville & Dawson, 2010; Wu &Tsai, 2007). What is more to the point, teaching of socioscientific issues contributes to the development of science literacy identity (Holdbrook & Rannikmae, 2007; Kolsto, 2001). Therefore, socioscientific issue based instruction is among the essential approaches of science education. Socioscientific issues can be seen as the tools foregrounding humanist part of science and it is seen as indispensable for responsible citizens (Kolsto, 2001).

Science teachers avoid ethic, moral and political discussions in their classes. As prospective teachers are not sufficiently exposed to socioscientific subjects during their undergraduate training, they graduate with insufficient knowledge about such subjects (Anagün & Özden, 2010). On the other hand, Türkmen, Pekmez and Sağlam (2017) concluded that prospective science teachers do not have adequate knowledge about socioscientific issues; yet, they have mastered the techniques and methods needed to teach these subjects. Evren-Yapıcıoğlu (2016b) stated that prospective science teachers have difficulties in recognizing objectives related to socioscientific issues as they are implicitly expressed in science curriculums in Turkey. Besides, it is argued that teaching such contradictive subjects may result in weak classroom management and displeasure of parents (Stradling, 1984). Today many teachers are not aware of the fact that science courses should be integrated with ethics and values (Bossér, Lundin, Lindahl & Linder, 2015) and they use most of their time in classes to teach basic science principles (as cited in Cristenson, Chang-Rundgren & Zeidler, 2014). Though, in England and South Africa, difficulties concerning the teaching of controversial issues are anticipated in schools and teacher training programs (e.g. curriculums with highly-loaded content, lack of time, lack of instructors, school authority, negative reactions from both parents and students), teaching of such issues is still maintained (Chikoko, Gilmour, Harber & Serf, 2011). As a consequence, though the potential of socioscientific issues in teaching science is emphasized in the related literature, it is hard to declare that socioscientific issues are a part of science classes (Reis & Galvão, 2004). Given the delineations above, it can be argued that while socioscientific issue based instruction is seen to be an up-to-date movement that contributes to the development of students' science literacy identity, raises their awareness of the relationship of science with ethics, politics, morality and values, some difficulties are anticipated in its implementation.

In the current study, the advantages and disadvantages of the implementation of the socioscientific issue based instruction in science classes were explored on the basis of the opinions of prospective science teachers. Actually, in general, it is quite difficult to persuade in-service teachers to adopt a new educational reform and even if it is adopted, it takes a long time. Therefore, it seems to be of great importance to make teacher trainers recognize the usefulness of a new reform movement and to train their students in this direction so that they can see its advantages and disadvantages. Thus, the study group of the current study was decided to be constituted by prospective science teachers. Though the socioscientific issues and socioscientific issue based approach are not a part of teacher training programs in Turkey, their inclusion in these programs can be made possible with the personal efforts of

instructors at universities. On the other hand, the Ministry of National Education (MONE, 2013, 2018) allocates some place to socioscientific issues in 3rd, 4th, 5th, 6th, 7th and 8th grades and asks science teachers to address these issues in their science classes. Therefore, teachers having completed their prospective training and working as teachers experience difficulties in the class. In this regard, the current study aims to elicit the opinions of prospective science teachers about the limitations of the socioscientific issue based instruction and its advantages and disadvantages, thus valuable information can be provided for science instructors, researchers and teachers and important contribution can be made to the literature.

2. Method

A single case study design, which is one of the qualitative research methods, has been utilized to identify the advantages and disadvantages of socioscientific issue based instruction on the basis of the prospective science teachers' views. In the single case study, researchers investigate to explore factors (setting, individuals, situation, process etc.) related to one case and focus on their effects on this case and describe the case in detail (Merriam, 2009; Yıldırım & Şimşek, 2008). According to Yin (2003), if the researcher only wants to do research on one single thing (for example a person from a specific group) or a single group (for example a group of people), a single case study is the best choice for him/her. Current study's research questions are below.

2.1 Participants

This study was conducted with 40 prospective science teachers that were 3rd year students at the department of science education in one of the education faculties in Turkey. Participants were enrolled in the special teaching method course in the spring term of 2015-2016 academic year.

The ages of participants in the studies ranged from 19 to 21 years old. Socioscientific issue based instruction was applied in the special teaching methods course. Although 40 prospective science teachers participated in the activities of socioscientific issue based instruction, 26 participants kept diaries on a voluntary basis. The prospective science teachers kept diaries from the beginning to the end of the research (for a total of seven weeks). Writing in their diaries was entirely under their own control. At the end of the implementation period, focus group interview was made with eight volunteer participants five of whom are female and three are male. Some questions were asked to elicit the general demographics of the participants before the focus group discussion began. Through these questions, it was found that the academic achievement of the eight participants was 2.40 and above. Prior to implementation of socioscientific issue based teaching activities, science teacher training program was examined. No compulsory or elective course was found addressing socioscientific issues and contents by the researcher. Also, before the implementation process, the question of *"have you ever heard of the "socioscientific issue" in your daily life or courses?"* was asked by researcher, the whole class answered *"No!"* in a word. For this reason, it can be said that prospective science teachers do not have any knowledge and experience about socioscientific issues and its instructional activities.

2.2 Data Collection Tools

Data were collected through student diaries and focus group interview. In current research, the primary data resources were diaries because diaries were kept by the prospective science teachers from the beginning to the end of the implementation process. Diaries have become popular qualitative data collection tools in educational research recently and they are within the individual document category. Personal data sources are believed to yield reliable qualitative data on attitudes believes and views of individuals (Merriam, 2009). In addition,

through diaries, the prospective science teachers were able to express their feelings, thoughts and experiences freely on socioscientific issue-based instruction process. The prospective science teachers themselves decided on the time allocated to diary keeping. The secondary data source was a semi-structured focus group interview form. The semi-structured focus group interview form allows the researcher to lead the interview (Meriam, 2009). Questions may be modified during the interview. If participants answer definite questions while speaking about some other topics, researcher may skip these questions or may ask participants for the details (Türnüklü, 2000). For this reason, semi-structured forms are flexible data collection tools. For this reason, the researcher originally planned the semi structured focus group interview form as ten open ended questions. However, some questions in the form were not asked to the prospective teachers because they had already answered them while responding to other questions. Thus, the final semi-structured focus group interview form was comprised of six open-ended questions. One of the questions in the focus group interview form is *"During our lesson we have implemented some teaching activities of socioscientific issue based instruction, what kind of contributions do you think it can make to your students in the future?".* The focus group interview was conducted in the meeting room with the table design in the form of U and lasted 55 minutes. The researcher and all participants were able to see each other's face and hear their talks. The focus group interviews were recorded on a tape recorder with the permission of the prospective teachers.

2.3 Data Analyses

Data were analyzed through inductive content analysis. Content analysis is used to determine the presence of words, concepts, themes, characters or cues in one or many forms (Kızıltepe, 2015). The inductive content analysis process was followed in the study. The following process steps have been applied for the analysis of raw data from two data sources (focus group interview and prospective science teachers' diaries).

- ✓ Firstly, 26 prospective teachers' diaries were read one by one and emotions, experiences and thoughts expressed by participants related to socioscientific issue based instruction activities were marked in diaries.
- ✓ The marked statements were transferred to the computer as a MS Word file.
- ✓ Focus group interview tape recorders have been transcribed.
- ✓ All transcripts from diaries and focus group interview were combined into a single word file.
- ✓ Data reduction for transcriptions of both diaries and focus group interview was carried out.
- ✓ Data was coded based on the definite concepts as stated by Strauss and Corbin (1990).
- ✓ Themes and sub-themes were created through similar codes.
- ✓ A coding scheme was created based on the codes, sub-themes and themes.
- ✓ An expert in qualitative research checked 20% of the coding scheme and written form.
- ✓ Intercoder reliability (Miles & Huberman, 1994) of this research is 90%.

2.4 Process

Socioscientific issue-based instruction was carried out with the participants for 4 course hours (50 mins) a week and 7 weeks in total in the spring term of 2015-2016 academic year. The instruction was applied to the 3rd year students within the special teaching methods course. Special teaching method is compulsory course in the third year of science teacher training program. In this course, it is aimed that third-year students gain experience and practice about special teaching methods, techniques and strategies for science education. In

the implementation process, Evren-Yapıcıoğlu (2016a)'s model was used. The details in this model is described as below.

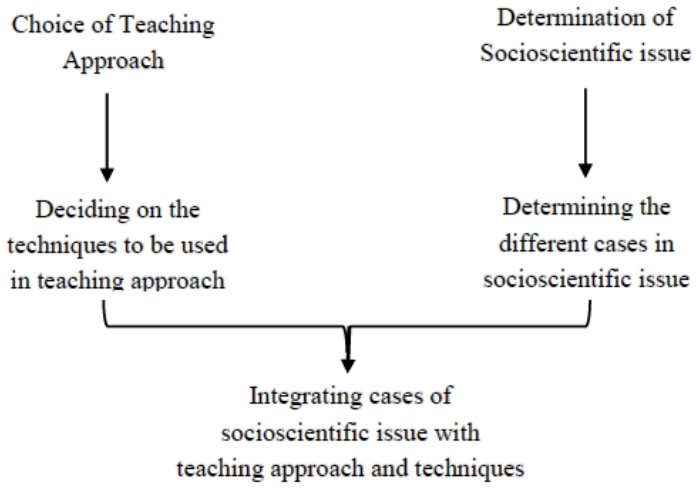

Figure 1. *The teaching process based on socioscientific issue-based instruction approach* (Evren-Yapıcıoğlu, 2016a)

Seven activities were designed by researcher and applied through the socioscientific issue-based instruction. Each topic within the activities carries a socioscientific characteristic. The topics are dolphinariums, Kyoto Protocol, genetically modified organisms, genetic tests, alternative energy sources, use of recycled black plastic bags, organ donation. Each of the activities that are concept cartoons, dilemmas cards, word association test, problem scenarios and news bulletin of science teaching was integrated with special teaching methods/techniques. Argumentation process was implicitly carried out in all activities.

The content of a sample activity prepared by researcher about socioscientific issue-based instruction is summarized below. In this activity, dilemma cards, which are a teaching tool of collaborative learning approach, were planned and used according to cases of socioscientific issue: organ donation.

2.4.1 Activity 3: I can donate my organs! I cannot!

Preparation: Each student was given a small post-it-paper and envelope in the beginning of the course. Students were later asked if they would like to donate their organs as a warm up question. Each student wrote down his/her answer and the reason on papers and placed the papers to the ballot.

Application and Decision: Students were given dilemma cards about organ donation (Appendix 1). A dilemma card is both a means of questioning and evaluation of a decision with the peer groups and a teaching tool encouraging students to express their opinions believes and acts frankly (Oliveira, Akerson & Ortfield, 2012). While there is a real-like scenario on the front side of the dilemma paper, there are moral, ethical, emotional, economic and political options related to organ donation with a socioscientific aspect on the backside. Each student was asked to opt or write his or her own decision.

Argumentation: Peer learning groups were organized at this stage. Thus, prospective science teachers had a chance to have arguments using argumentation elements. After the small group argumentation, students had a big group argumentation. At this stage, reasons for each decision were questioned and defended using argumentation elements. If there was more than one final decision within the group, then these decisions were supported with a different argument.

Co-decision: Groups with different decisions were asked to have a common decision at this stage. Students tried to persuade peers using argumentation items. Then students had a big group discussion.

Critical note: The prospective science teachers had prior knowledge and experience on argumentation stage

3. Findings and Results

Findings of the research show that there are some advantages of socioscientific issue-based instruction. Eight sub-themes are identified from diary and focus group interview data. These are upskilling (f:13), thinking development (f:10), opinion development (f:4), social awareness (f:8), meaningful learning (f:14), character development (f:5), vocational development (f:6), and science literacy (f:1). The prominent ones considering frequencies are upskilling and meaningful learning. Table 1 presents 31 different codes and 61 repeating codes (frequencies) related to socioscientific issue-based instruction.

Table. *Codes and sub-themes of the socioscientific issue-based instruction's advantages*

Codes (C) and sub-themes (ST)			**f**
ST1	Upskilling		13
	C1	Research Skill	
	C2	Critical Thinking	
	C3	Communication Skill	
	C4	Problem Solving Skill	
	C5	Questioning Skill	
	C6	Reflective Thinking	
ST2	Meaningful Learning		14
	C7	Active Participation	
	C8	Effective Learning	
	C9	Problem Centered Learning	
	C10	Activating Passive Students	
	C11	Student Centered	
	C12	Instructive	
ST3	Opinion Development		10
	C13	Multiple Thinking	
	C14	Different Viewpoints	
	C15	Encouraging Thinking	
	C16	Learning Thinking	
	C17	Sharing Thought	
ST4	Social Awareness		8
	C18	Raising Awareness	
	C19	Raising conscious and sensitive individuals	
	C20	Raising awareness of family and public	
ST5	Vocational Development		6
	C21	Transferring to vocational life	
	C22	Ensuring vocational development	
	C23	Raising vocational awareness	
ST6	Character Development		5
	C24	Respect to different opinions	
	C25	Empathy	
	C26	Self-efficacy	
ST7	Opinion Development		4
	C27	Gaining different viewpoints	
	C28	Developing viewpoints	
	C29	Considering in socioscientific perspective	
ST8	C30	Science literacy	1
	C31	Contributing to science literacy	
TOTAL			61

The prospective science teachers' views show that socioscentific issue-based instruction is an effective approach that contributes to the development of skills, different perspectives and thinking to meaningful learning, social awareness, vocational development and science literacy. Below are notes on advantages of socioscentific issue-based instruction from prospective science teachers' diaries and focus group interview.

> S45: *This week we talked about socioscentific issue-based instruction. I really liked this approach. I am interested in the subjects we discuss during the course. As I like discussions, this approach is the one I can use with pleasure. This approach deals with dilemmas that society face so I believe that it can help students develop arguments, foster thinking, defend their arguments and change their opinions when they are wrong. I think that through this approach, teaching could be much more effective and permanent.* (Quotation from a prospective science teacher's diary)

The prospective science teacher (coded as S45) emphasizes that socioscentific issue-based instruction develops meaningful learning through effective and permanent learning and he argues that this approach helps develop thinking skill. Another prospective science teacher (coded as yellow) states that socioscientific issues are striking ones so such topics achieve great attendance. He continues, while basic scientific knowledge has a certain reality, socioscentific issues do not have one certain truth and this helps passive students attend actively, this in turn, encourages the students.

> *Yellow: …While I was feeling distracted in the class I heard they talking about socioscientific issues and this got my attention. I was encouraged to get interested in the course back. That is why I think this approach should be definitely used in the classes. Socioscientific issues are effective as they both allow teacher to get to know the students better and encourage students to have a word. If teacher asks a question, it has a certain answer whether someone knows or not. Students who know answer raise their hands and others stay silent. This goes on like this and certain students do not have a chance to attend discussion and get discouraged. But when it comes to socioscientific issues, they are the ones that touch to all society. So, if we carry out such an activity talk on these issues, then I think that these students, who are afraid to talk, can actively attend courses. They may get encouraged in basic knowledge through this way. We can also ensure teaching socioscientific issues.* (Quotation from focus group interview).

Prospective science teachers also stated that socioscientific issues help students feel respect and empathy for others and improve their self-reliance and self-efficacy, all of which are important for character development. Below is an example of how socioscientific issues help students feel special.

> *Blue: I am blue. In my opinion, socioscientific issues based instruction gives an opportunity to comment on almost any subject whether we know in detail or not, we as Turkish people have such characteristic…Children follow daily happenings continuously. They argue on them, have different approaches to them, so having their word on such topics actually would make them feel special.* (Quotation from focus group interview)

Another advantage of socioscientific issues based instruction is that it raises awareness of the environment and society by contributing to bringing up sensitive and conscious individuals. Children who are knowledgeable on socioscientific issues in the school may play

a role to raise awareness in their families and communities. For example, a prospective science teacher (coded as S42) explains this as follows.

> *S42: I think socioscientific issues and teaching them in the classrooms are extremely crucial. As socioscientific issues are the topics that affect our society and environment, students get more sensitive. Once socioscientific issues are taught in a proper way, the students inform their families as well. They get more sensitive to the environment, socioscientific issues and solution seeking.* (Quotation from prospective science teacher diary)

As well as advantages, findings of the study show that there are some disadvantages of the socioscientific issues based instruction. Four sub-themes were discovered related to disadvantages of the socioscientific issues based instruction. These are disadvantages for teacher, student, teaching and learning process and inadequacy of learning environment (Table 2).

Table 2.*Codes and sub-themes of disadvantages of the socioscientific issue-based instruction*

Codes (C) and sub-themes (ST)			**f**
ST1	*Disadvantages for teacher*		10
	C1	Inadequate background knowledge	
	C2	Inadequacy in classroom management	
	C3	Requirement of preliminary preparation	
	C4	Teacher's responsibility	
ST2	*Disadvantages for students*		9
	C5	Causing misconception	
	C6	Causing misunderstanding	
	C7	Mind puzzling	
	C8	Serious student discussion	
	C9	Effect of teacher position on an issue	
	C10	Inconvenient age group	
ST3	*Disadvantages for teaching and learning process*		8
	C11	Shortage of time	
	C12	Not every topic is a socioscientific issue	
ST4	*Inadequacy of learning environment*		2
	C13	Inadequacy of classroom	
	C14	Application problem in crowded classes	
TOTAL			29

Table 2 shows that there are disadvantages for teacher (ST1), student (ST2), teaching and learning process (ST3) and inadequacy of learning environment (ST4) in the socioscientific issues based instruction. Findings also show that the highest number of disadvantages are encountered by teachers (f:10). Table 2 presents 14 different codes and 29 repeating codes (frequencies) related to disadvantages of the socioscientific issue-based instruction.

Some sample statements uttered by the prospective teachers about the disadvantages of the socioscientific issue-based instruction from diaries and focus group interview are given below.

> *S23: … I think many teachers do not even know about these issues. Actually, these are real face of the science. They are afraid, because they have no idea or content knowledge about these issues*. (Quotations from prospective teacher's diary)

> *S13: Teacher! The students in our study group are younger. Most of the time they believe in everything that their family or teachers say (eee) how I should know (eee)… If the teacher is involved, the students immediately accept what he/she says. This is not correct. Then the teacher trains individuals as*

he/she wishes. Because of these, teachers must be objective. Teachers should not explain their own decisions, so that students can make their own decisions. (Quotations from prospective teachers focus group interview).

S38: We were very excited when we were doing activity about socioscientific issues. Some of our friends, I do not give a name now…They did their utmost to drag out discussions. I will say here is that teacher's attitude or position is important. (Quotations from prospective teacher's diary).

3. Conclusion and Discussion

Socioscientific issues based instruction has been one of the teaching objectives in order to educate conscious, sensitive and science-literate individuals. Although these issues are substantial in science teaching, science teachers are nervous to teach them. This research identified advantages and disadvantages of the socioscientific issues based instruction in science courses from the viewpoint of prospective science teachers. Findings of the study show that there are more advantages (f:61) of the socioscientific issues based instruction than disadvantages (f:29). The prospective science teachers indicate that this approach is advantageous in serving to upskilling, ensuring meaningful learning, developing thinking, raising social awareness, supporting vocational and character development and contributing to science literacy. The socioscientific issues-based instruction ensures meaningful learning according to the prospective science teachers because this approach promotes active participation, effective and problem centered learning, student centered learning and gives a chance for active participation of passive students in the class. One prospective science teacher explains the situation *"… Socioscientific issues concern everyone in a society so anyone may have a word on them. Thus, I think we can encourage passive students through this approach.*" Socioscientific issues are both on media and in the daily speech and discussion of society. Such interesting topics would encourage passive students to actively attend class discussions. Another advantage of the socioscientific issues based instruction is upskilling, which encourages and develops students on research, critical thinking, problem solving, questioning and reflective thinking. There are similar results reported in the related literature (Ergin, 2013; Klosterman & Sadler, 2010; Zeidler, Sadler, Applebaum & Callahan, 2008; Zeidler & Nichols, 2009). There are some other remarkable findings in the literature emphasizing that this approach also promotes decision-making, informal reasoning and argumentation (Lee, 2007; Sadler & Zeidler, 2005; Zohar & Nemet, 2002). Students with socioscientific issues background may have a mission to raise awareness of their families and community. Kolsto (2001) emphasized that socioscientific issues should be in formal education system in order to contribute to raising conscious and sensitive individuals.

Socioscientific issues play an important role in character development as they contribute to feeling respect for different opinions, empathy, and self- competence. Student participation in carefully prepared activities about socioscientific issues strengthens their character development through development of confidence, self-sacrifice, mercy, and moral sensitiveness (Zeidler & Nichols, 2009). The prospective science teachers stated that the activities in the socioscientific issues based instruction contributed to their professional awareness and development.

The other theme of the research is the disadvantages of the socioscientific issues based instruction application according to the prospective science teachers. The prospective science teachers share the opinion that the socioscientific issues based instruction has some disadvantages for teachers, students, teaching and learning process, and learning environment. Inadequate background knowledge of teacher is seen as an obstacle to use of

the socioscientific issues based instruction in science classes. Contrary to this result, Soysal (2012) and Kutluca (2012) found that background knowledge is not a significant factor in prospective science teachers' socioscientific argumentation levels. On the other hand, same qualitative research results show that prospective science teachers agree that background knowledge is necessary in teaching socioscientific issues. Another disadvantage of the socioscientific issues based instruction for teachers is classroom management. Similarly, Straling (1984) argues that teachers avoid teaching contradictive subjects in their classes because of the difficulties involved in classroom management. The prospective science teachers also stated that socioscientific issues require preliminary preparation and teacher responsibility, which are also disadvantages for teachers. The socioscientific issues based instruction has disadvantages for students like causing misconception, misunderstanding and mind puzzling. Pedretti (1999) argues that teachers avoid and are afraid of discussing contradictive issues, as they do not know which position they should take or how to end the discussion. Oulton, Dillon, and Grace (2004) emphasize that while teachers should protect their objective and balanced position in contradictive discussion, they should not use their position in an authoritarian manner.

3.1 Suggestions

As a conclusion, the use of this approach having many advantages by prospective teachers in their future classes is believed to be very useful in general. Thus, it can be suggested that besides instructional approaches focusing on the teaching of basic science disciplines, the socioscientific issue-based instructional approach should be effectively employed. In this way it can be possible to train students as more experienced, critical, creative and reflective citizens about these issues they encounter in their daily lives.

In light of the prospective teachers' opinions about the disadvantages of the socioscientific issue-based instructional approach, it can be suggested that educators that will use this approach in science classes need to plan the preparation stages well so as to minimize the disadvantages related to time and classroom management, need to have mastered the content of the socioscientific issue to be addressed, to adopt an impartial position during classroom discussions and to organize cooperative student groups if they are to work in crowded classes. Moreover, the prospective teachers stated that the socioscientific issue-based instructional approach contributed to their professional development. Thus, this approach can help prospective teachers to gain experience about how to teach contradictory socioscientific issues in the class.

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Appendix 1. Example of Dilemma Card

Front Side	**Back Side**
 You visit a hospital and patients who are waiting for organ donation. You get very affected. **What would you think about donating your organs?**	1. I would donate my organs without thinking twice 2. I could only donate my organs form y close relatives 3. I cannot donate any of my organs, as I would fear of living with a lack of any organ. 4. I would think about it if I need to. 5. I cannot donate in anyway as they belong to me. 6. Other….

Note: Photo retrieved from https://organ.saglik.gov.tr/