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A Different Perspective on Socioscientific Issues: Cooperative Learning Activities with Preservice Classroom Teachers[1]

Research Article

Ayten ARSLAN[2]

[2]*Muş Alparslan University, Faculty of Education, Department of Primary Education, Mus, Turkey,* ORCID:0000-0001-8832-0276

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ABSTRACT

The aim of the study was to determine the effect of different cooperative learning methods (CLMs) on pre-service teachers' views on socioscientific issues (SSIs), and cooperative learning applications and attitudes towards SSIs. In this study an explanatory sequential mixed research design was used. The study sample consisted of 40 pre-service classroom teachers of the faculty of education and was divided into three groups: learning together group (n=12), jigsaw group (n=16), and control group (n=12). The study consisted of two parts: quantitative and qualitative. In the quantitative part, a one group pretest-posttest design was used, and data were collected using the Scale of Attitudes towards Socioscientific Issues (SATSI) and analyzed using descriptive analysis. In the qualitative part, phenomenology was used, and data were collected using a semi-structured interview form and analyzed using content analysis. Descriptive analysis showed no statistically significant difference in SATSI scores between groups. However, the jigsaw group had significantly higher posttest SATSI scores than pretest scores. Content analysis showed that CLMs improved participants' attitudes towards, raised their awareness of SSIs, helped them develop social skills .

Keywords:
Cooperative learning, socioscientific issues, preservice classroom teachers, mixed research

Introduction

Rapid advances in science and technology in the twenty-first century affect society and social life in numerous ways. They, on the one hand, promote social progress and, on the other hand, cause risks and controversies, which have recently been the subject of research in science education that is believed to be reformed (Osborne & Dillon, 2008; Tytler, 2007). Scientific advances and their repercussions have led to numerous social problems, referred to as "socioscientific issues" (SSIs). For an issue to be considered an SSI, it must be related to science subjects and socially significant (Topçu, Muğaloğlu & Güven; 2014). Numerous global institutions, organizations, and projects [American Association for the Advancement of Science (AAAS), 1990; Ministry of National Education of Turkey (MONE), 2013; National Research Council (NRC),

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[2]Corresponding author's address: Muş Alparslan University, Faculty of Education, Department of Primary Education, Muş, Turkey.
Telephone:+90 (436) 249 1402
e-mail:aytenarslan23@gmail.com
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1996] advocate that SSIs should be discussed and analyzed in science education and incorporated into curricula (Topçu, at al, 2014). In this context, the goal of science education is to provide students with the opportunity to develop science literacy skills on the premise that recognizing the relationship between science technology and society (STS) transforms students into responsible people who are capable of making informed decisions. Therefore, the key objectives of STS education are to meet students' needs, help them choose a career, encourage them to use inquiry skills, and find solutions to social issues (Çepni, Ayvacı & Bacanak, 2006). Collette and Chiapetta (1989; cited in Bacanak, 2002) argue that students with scientific literacy skills can think independently and critically about important social issues and make informed decisions about them. Students who are informed of SSIs and their societal repercussions can analyze those issues better, make informed decisions about them, and take a stance and take action to make a change (Tal & Kedmi, 2006). SSIs are, therefore, part of science literacy and STS education. An SSI is defined as a concept that involves all STS classifications and takes into account the ethical aspects of science and students' emotional development (Zeidler, Walker, Ackett & Simmons, 2002). In other words, SSIs are considered complex and unconstrained problems with unclear answers and contradictions (Sadler, 2004; Topçu, 2010). SSIs have become an integral part of education in many countries because they promote discussion during learning (Dawson & Venville, 2009). Discussion and analysis of SSIs is an integral component of science literacy and necessary for science education at all levels (secondary school, high school and college) (Sadler & Zeidler, 2004). What is more, Topçu (2015) argues that thinking patterns developed by students to interpret and analyze SSIs should be taken into account when preparing curricula for all levels. SSIs are used in learning environments as either ends or means (Sadler, 2004; Topçu, 2010). SSIs are used as a means (cited in Tekbıyık, 2015) of teaching students content knowledge (Klosterman & Sadler, 2010; Yager, Lim & Yager, 2006; Dori, Tal & Tsaushu, 2003) and helping them develop scientific literacy (Morin, Simonneaux, Simonneau &Barraza, 2013), argumentation (Lee, 2007; Albe, 2008; Jimenez-Aleixandre, Rodriguez &Duschl, 2000; Iordanou & Constantinou, 2014; Khishfe, 2014), and discussion skills (Lewis & Leach, 2006; Rudsberg, Ohman & Ostman; 2013). Most SSIs are based on socioscientific activities (Gologlu, 2009), argumentation -based or -supported activities (Domaç, 2011; Yaman, 2012), discussion activities (Taşpınar, 2011) involving articles, case studies, group discussions, and decision making processes (Cansız, 2014), field trips (Atabey & Topçu, 2017), and extra curricular trips, local newspapers, and presentations (Çapkınoğlu, 2015). Students who learn about SSIs with conventional methods have difficulty making the right decisions on these issues (Kılınç, Boyes & Stanisstreet, 2013) because SSIs have complex scientific, logical, and ethical aspects, which call for a theoretical background (Levinson, 2006). Therefore, classes should be performed using models, methods, and techniques that help students develop thinking skills to make sure that they can make the right decisions on SSIs in the future. Cooperative learning can be used to teach SSIs because it is performed with small heterogeneous groups and encourages group members to respect each other's views, learn from each other, and use problem solving strategies (Doymuş, Şimşek & Şimşek, 2005; Maloof & White, 2005). There are very few studies addressing the use of CLMs to teach SSIs (Tekbıyık, 2015; Kırbağ Zengin, Alan & Keçeci; 2016). We, therefore, believe that this study will fill the gap in the literature and provide insight for further research. SSIs play an increasingly important role in developing students' science literacy skills. We, therefore, believe that this study will make significant contributions to the literature and pave the way for further research because it investigates the effect of CLMs on the teaching of SSIs and on students' awareness and attitudes towards SSIs. We also believe that our results will encourage preservice teachers and teachers to use different teaching approaches.

Research Objective and Research Questions

The aim of the study was to determine the effect of CLMs on preservice teachers' views and attitudes towards SSIs. The main research question was "What is the effect of CLMs on the teaching of SSIs?" The study sought answers to the following subquestions:

The quantitative part of the study sought answers to the following subquestions:

1- What kind of effect do CLMs have on preservice teachers' attitudes towards SSIs?

The qualitative part of the study sought answers to the following subquestions:

1. What kind of effect do preservice teachers think CLMs have on their attitudes towards SSIs?
2. What kind of effect do preservice teachers think CLMs have on their awareness of SSIs?
3. In what way do preservice teachers think CLMs help them develop social skills?

Limitations

1. The study addressed only two SSIs; nuclear power plants, and biotechnology and cloning.
2. The study sample consisted only of 40 preservice classroom teachers.
3. Only two CLMs (jigsaw and learning together) were used.

Method

This study employed an explanatory sequential mixed methods design and involved two stages; (1) quantitative data collection and analysis, and (2) qualitative data collection and analysis. Qualitative data are collected to better understand, investigate, and enrich the quantitative data (Creswell & Plano Clark, 2015, p. 79). In the quantitative part, a pretest-posttest control group experimental design was used. In the qualitative part, phenomenology was used. Figure 1 shows the diagram of the research design process.

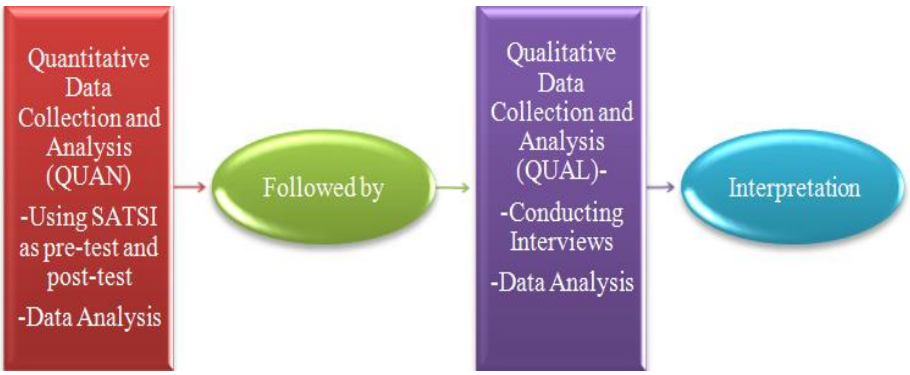

Figure 1. Diagram of Research Design Process

Participants

The study sample consisted of 40 preservice classroom teachers of the faculty of education and was divided into three groups: learning together (n=12), jigsaw (n=16), and control (n=12). Easily accessible case sampling, which is one of the purposeful sampling methods, was used in the selection of the study group. While creating groups, random selection was made and attention was paid to the heterogeneity of the groups.

Data Collection Tools and Analysis

Quantitative Data Collection Tools and Analysis

Quantitative data were collected using the Scale of Attitudes towards Socioscientific Issues (SATSI) and analyzed using descriptive analysis. The Scale of Attitudes towards Socioscientific Issues (SATSI), which was developed by Topçu (2010), was used to determine participants' attitudes towards SSIs. It is a 5-point Likert type scale consisting of 30 items and three subscales; Benefits and significance of socioscientific issues (α=0.90); Enjoying socioscientific issues (α=0.81); Anxiety about socioscientific issues (α=0.70).

Descriptive statistics were calculated, and quantitative data were tested for normality, and then, analyzed using parametric or nonparametric methods.

Qualitative Data Collection Tools and Analysis

After cooperative learning activities, the experimental groups (learning together and jigsaw) were interviewed using a semi-structured form developed by the researcher. The aim of the interviews was to find answers to the questions of whether CLMs raised participants' awareness of SSIs and improved their attitudes towards them, whether CLMs helped them develop social skills. The researcher sometimes asked further questions to clarify participants' responses.

Qualitative data were collected using a semi-structured interview form and analyzed using content analysis. The interviews were first transcribed and then coded as short, simple, and clear symbols. Questions about CLMs and SSIs were taken as subheadings. Participants' views were used to determine concepts. The number of participants addressing the same concepts was determined, revealing a model for coding and analysis. After coding, a code list was developed and, common points were determined, and then, themes were developed and interpreted.

Data Collection and Application Process

First, all participants took SATSI as a pretest. The experimental groups were taught SSIs using the jigsaw and learning together methods while the control group was taught SSIs using the conventional method specified by the curriculum. All participants then took SATSI as a posttest. Afterwards, interviews were conducted with the experimental group participants. All interviews were audio-recorded. Participants were assigned pseudonyms (Aynur, Filiz, Furkan etc.) to assure anonymity.

"Nuclear Power Plants" and "Biotechnology and Cloning" were the SSIs of choice because they caused the most controversy and discussion. SSI activities were performed using the jigsaw and learning together methods in the experimental groups while they were performed through group work in the control group. The "Nuclear Power Plants" and "Biotechnology and Cloning" were divided into subheadings, and the SSI activities were performed three hours a week for eight weeks (four weeks for each SSI). In all groups, the same subheadings were used every week to address the issues. Figure 2 shows the subheadings.

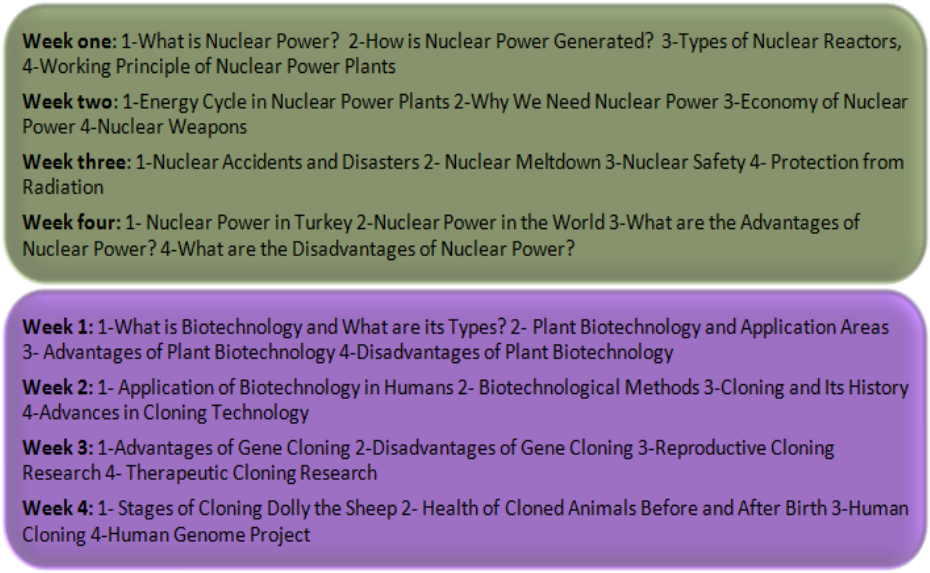

Figure 2. SSI Subheadings

Procedure in Jigsaw Group

1. Participants were informed about the procedure and the two SSIs, and then, were administered SATSI as a pretest.
2. Participants were divided into four groups of four and into main groups. They were asked to name their groups for group commitment. Sub-headings of SSIs have been researched by the members of the group and the subjects have been covered with the necessary information and documents. The members of the main groups were assigned subheadings and asked to do research on them. Afterwards, those who were assigned the same subheadings were brought together to create expert groups. The participants in the expert groups exchanged information with one another and discussed and bridged the gap in their knowledge. The participants in the expert groups returned to their original groups and shared their knowledge with their groupmates. Then a group was randomly selected and asked to make a presentation on the issue that it was assigned. All class discussions were held.
3. SATSI was administered (as a posttest) to participants, who were then interviewed.

Procedure in Learning Together Group

1. Participants were informed about the procedure and the two SSIs, and then, were administered SATSI as a pretest.
2. Participants were divided into four groups of three and asked to name their groups for group commitment. The group members were assigned the roles of a spokes person (communicating with other groups and informing the teacher of problems), a recorder (recording data), a controller (asking the teacher for help and checking whether group members are participating in activities), and an observer (encouraging group members to participate in activities and taking observation notes). The roles were rotated every week. Sub-headings of socioscientific issues have been researched by the members of the group and the subjects have been covered with the necessary information and documents. The groups did research on the SSIs together and performed group discussions.
3. SATSI was administered (as a posttest) to participants, who were then interviewed.

Procedure in Control Group

1. Participants were informed about the procedure steps and the two SSIs, and then, were administered SATSI as a pretest.
2. Participants were divided into four groups of three. There was no intervention in the distribution of tasks within the groups. Groupwork was used. Then a group was randomly selected and asked to make a presentation on the issue that it was assigned. SATSI was administered as a posttest.

Results and Interpretation

Quantitative Data and Interpretation

SATSI Results and Interpretation

The main research question was "What kind of effect do CLMs have on preservice teachers' attitudes towards SSIs? Between-group differences in SATSI pretest scores were analyzed. Before analysis, the data were tested for normality. Table 1 shows the results.

Table 1. Normality Test for SATSI Pretest Mean Scores

Groups	n	Skewness	Kurtosis
Learning together	12	-1.73	4.28
Jigsaw	16	-.53	-.16
Control	12	-.17	-1.01

The data were not normally distributed, and therefore, the Kruskal-Wallis H test was used for data analysis. Table 2 shows the results.

Table 2. Kruskal-Wallis H Test Results for SATSI Pretest Mean Scores

Groups	n	Mean Rank	X^2	sd	p
Learning together	12	22.08	.916	2	.633
Jigsaw	16	18.34			
Control	12	21.879			

There was no statistically significant difference in SATSI pretest mean scores between the groups, indicating that they all had similar attitudes towards SSIs before CLMs ($p>.05$).

Between-group differences in SATSI posttest scores were analyzed. Before analysis, the data were tested for normality. Table 3 shows the results.

Table 3. Normality Test for SATSI Posttest Mean Scores

Groups	n	Skewness	Kurtosis
Learning together	12	1.60	3.22
Jigsaw	16	1.67	3.22
Control	12	1.23	2.02

The data were not normally distributed, and therefore, the Kruskal-Wallis H test was used for data analysis. Table 4 shows the results.

Table 4. Kruskal-Wallis H Test Results for SATSI Posttest Mean Scores

Groups	n	Mean Rank	X^2	sd	p
Learning together	12	20.38	1.25	2	.53
Jigsaw	16	22.69			
Control	12	17.71			

There was no statistically significant difference in SATSI posttest mean scores between the groups, indicating that CLMs had no effect on participants' attitudes towards SSIs (p>.05).

Within-group differences between SATSI pretest and posttest scores were analyzed. Before analysis, the differences between the posttest and pretest scores were tested for normality. Table 5 shows the results.

Table 5. Normality Distribution Test for SATSI Pretest and Posttest Mean Scores

Groups	n	Skewness	Kurtosis
Learning together	12	1.87	5.05
Jigsaw	16	.28	.47
Control	12	-.03	-.49

The mean differences for the jigsaw and control groups were normally distributed, and therefore, a t-test was used for analysis. However, the mean difference for the learning together group was not normally distributed, and therefore, the Wilcoxon signed ranks test was used for analysis. Table 6 shows the results.

Table 6. Wilcoxon Signed Ranks Test Results of Learning Together Group Pretest and Posttest Scores

Pretest-Posttest	n	Mean Rank	Rank Sum	z	p
Negative Ranks	5	5.10	22.50	-1.06	29
Positive Ranks	7	7.5	52.50		
Difference	0				
Total					

There was no statistically significant difference between SATSI pretest and posttest scores for the learning together group, suggesting that learning together did not improve participants' attitudes towards SSIs (p>.05).

A t-test was used to determine whether there was a significant difference between SATSI pretest and posttest scores for the jigsaw learning group. Table 7 shows the results.

Table 7.T-Test Results for Jigsaw Group Pretest and Posttest Scores

Group	n	M	Ss	Sd	t	p
Pretest	16	3.32	.08	.33	-2.33	.034
Posttest	12	3.49	.05	.22		

There was a statistically significant difference between SATSI pretest and posttest scores for the jigsaw group, suggesting that the jigsaw method improved participants' attitudes towards SSIs (p<.05).

A t-test was used to determine whether there was a significant difference between SATSI pretest and posttest scores for the control group. Table 8 shows the results.

Table 8. Paired Samples T-Test Results of Control Group Pretest and Posttest Scores

Group	n	M	Ss	Sd	t	p
Pretest	12	3.42	.22	.06	-.50	.63
Posttest	12	3.46	.30	.08		

There was no statistically significant difference between SATSI pretest and posttest scores for the control group, suggesting that the teaching method in the current curriculum did not improve participants' attitudes towards SSIs (p>.05).

Data and Interpretation

Participants' Views of Learning Together Method

The first interview question was "What kind of effect do pre-service teachers think the learning together method has on their attitudes towards SSIs?" Twelve participants were interviewed to determine their views. Figure 3 and Table 9 show the interview results.

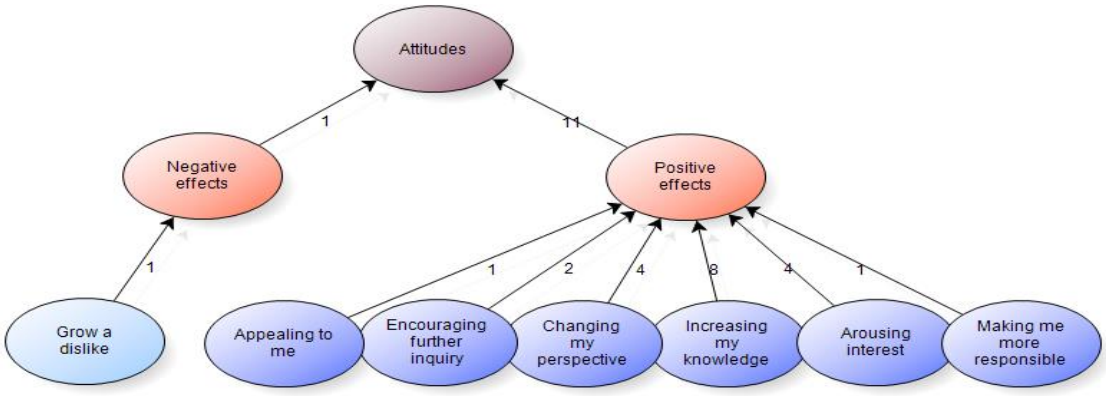

Figure 3. Participants' Views of Effect of Learning Together on Their Attitudes towards SSIs

Table 9. Participants' Views of Effect of Learning Together on Their Attitudes towards SSIs

Themes	**Codes**	**Participants**
Positive Effects	Increasing my knowledge	Aynur, Filiz, Furkan, Hale, Mert, Selin, Zeki, Züleyha
	Changing my perspective	Furkan, Murat, Melis, Ferhan
	Arousing interest	Adnan, Furkan, Selin, Mert
	Encouraging further inquiry	Aynur, Mert
	Making me more responsible	Canan
	Appealing to me	Hale
Negative Effects	Grow a dislike	Murat

Participants' views of the effect of learning together on their attitudes towards SSIs were grouped under the themes of "positive effects" and "negative effects." In what way they were affected were coded under these themes. The theme of "positive effects" consisted of the codes of "increasing my knowledge," "changing my perspective," "arousing interest," "making me more responsible," "appealing to me," and "encouraging further inquiry" while theme of "negative effects" included only the code of "Grow a dislike." The following are direct quotes from participants:

Mert: Yes, it [CLM] has because it's both increased my knowledge and aroused my interest. It was the first time I got offline and went to a library.

(Increasing my knowledge, Arousing interest)

Murat: Yes, it has a negative effect because it's changed my view on socioscientific issues. We had no idea about biotechnology, but now after all the things I've learned, I've grown a dislike to the word biotechnology.

(Grow a dislike)

The second subquestion was "What kind of effect do pre-service teachers think CLMs have on their awareness of SSIs?" Figure 4 and Table 10 show the interview results.

Figure 4. Participants' Views of Effect of Learning Together on Their Awareness of SSIs

Table 10. Participants' Views of Effect of Learning Together on Their Awareness of SSIs

Themes	Codes	Participants
Positive Effects	Increasing my knowledge	Mert, Selin, Zeki, Melis, Adnan, Aynur, Canan, Filiz, Hale
	Encouraging further inquiry	Adnan, Aynur, Filiz, Hale
	Arousing interest	Hale, Zerrin
	Changing my perspective	Furkan, Selin
	Making me more sensitive	Mert, Murat
	Arousing curiosity	Filiz, Hale
	Staying up-to-date	Filiz, Furkan
	Making me more responsible	Zerrin

Participants' views of the effect of learning together on their awareness of SSIs were grouped under the theme of "positive effects," which consisted of the codes of "increasing my knowledge," "encouraging further inquiry," "staying up-to-date," "making me more sensitive," "making me more responsible," "arousing curiosity," "arousing interest," and "changing my perspective." The following are direct quotes from participants:

Filiz: Yes, it definitely has. The things I've learned have made me more curious. I did research on some issues even though it wasn't homework or anything. I checked out the news and saw some documentaries.

(Arousing curiosity)

Zerrin: Yes, it has. It's made me realize that I should be more interested to learn about social issues and that I shouldn't be just content with what I know but instead learn more.

(Arousing interest)

The third subquestion was "In what way do pre-service teachers think CLMs help them develop social skills?" Figure 5 and Table 11 show the interview results.

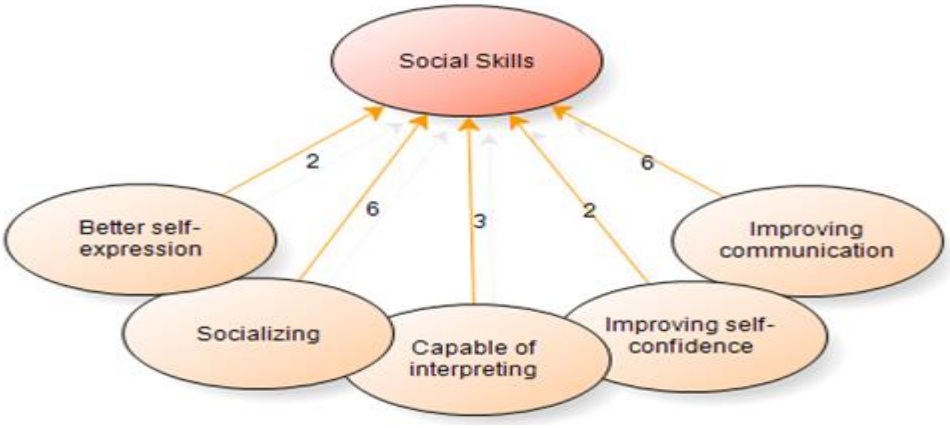

Figure 5. Participants' Views of Effect of Learning Together on Their Social Skills

Table 11. Participants' Views of Effect of Learning Together on Their Social Skills

Themes	Codes	Participants
Positive effecets	Improving communication	Adnan, Canan, Furkan, Mert, Murat, Semra
	Socializing	Adnan, Filiz, Furkan, Hale, Mert, Melis
	Capable of interpreting	Canan, Mert, Murat
	Improving self-confidence	Zeki, Zerrin
	Better self-expression	Aynur, Semra

Participants' views of the effect of learning together on their social skills were grouped under the theme of "positive effects," which consisted of the codes of "improving communication," "socializing," "better self-expression," "capable of interpreting," and "improving self-confidence". The following are direct quotes from participants:

Semra: Yes, it has. Before then, I had a hard time using my gestures and expressing myself, but now I think that it's helped me overcome that problem.

(Better self-expression)

Canan: I believe I can now communicate better. Other than that, I have things to say about the issues I was not particularly interested in before.

(Capable of interpreting)

Participants' Views of Jigsaw Method

The second interview question was "What kind of effect do pre-service teachers think the jigsaw method has on their attitudes towards SSIs?" Five participants were interviewed to determine their views. Figure 6 and Table 12 show the interview results.

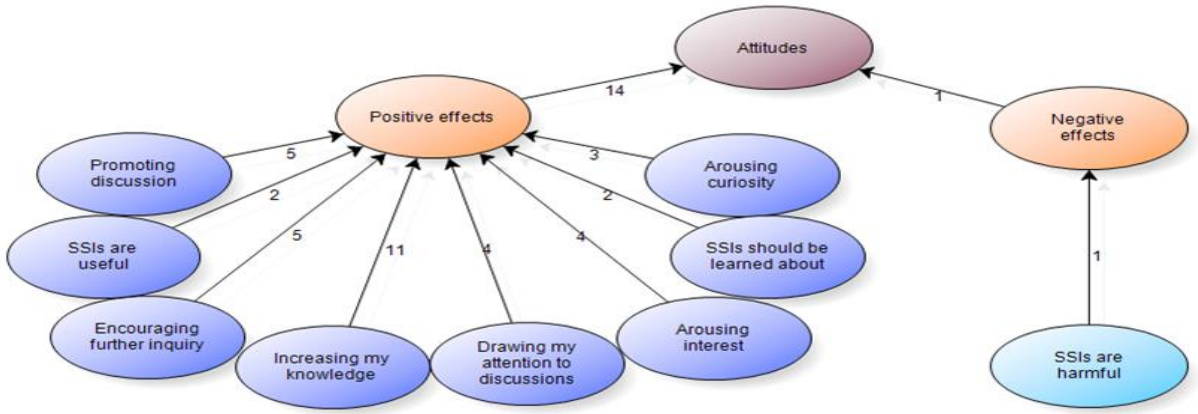

Figure 6. Participants' Views of Effect of Jigsaw Method on Their Attitudes towards SSIs

Table 12. Participants' Views of Effect of Jigsaw Method on Their Attitudes towards SSIs

Themes	Codes	Participants
Positive Effects	Increasing my knowledge	Ayça, Belma, Didem, Esra, Eda, Gülçin, İlayda, İbrahim, Kevser, Semra, Yeliz
	Promoting discussion	Ayça, Gülçin, İlayda, İbrahim
	Drawing my attention to discussions	Ayça, İlayda, İbrahim, Melih
	Arousing interest	Eda, Orhan, Semra, Yeliz
	Encouraging further inquiry	Didem, Erva, Yeliz
	Arousing curiosity	Erva, Orhan, Davut
	SSIs are useful	Erva, İbrahim
	SSIs should be learned about	Belma, Didem
Negative Effects	SSIs are harmful	Didem

Participants' views of the effect of the jigsaw method on their attitudes towards SSIs were grouped under the themes of "positive effects" and "negative effects." In what way they were affected were coded under these themes. The theme of "positive effects" consisted of the codes of "promoting discussion," "arousing interest," "SSIs are useful," "increasing my knowledge," "drawing my attention to discussions," "encouraging further inquiry," "SSIs should be learned about," and "arousing curiosity" while theme of "negative effects" included only the code of "SSIs are harmful." The following are direct quotes from participants:

> *Didem: It has positive effects. I got to discuss about various issues with my classmates. I learned new things from different sources. For example, I was in favor of nuclear power but I've learned about its risks and so I've changed my mind about it.*
>
> *(SSIs should be learned about)*

> *İbrahim: It has positive effects because I used to think that the risks of nuclear power were greater than its benefits but I've learned that it is actually the other way around. I also think that having discussions and exchanging ideas is great.*
>
> *(Drawing my attention to discussions)*

The third interview question was "What kind of effect do pre-service teachers think the jigsaw method has on their awareness of SSIs?" Fifteen participants were interviewed. Figure 7 and Table 13 show the results.

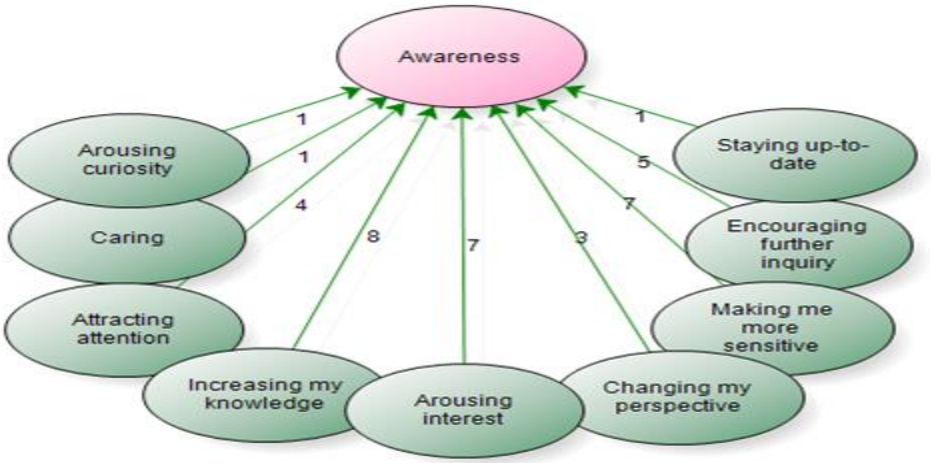

Figure 7. Participants' Views of Effect of Jigsaw Method on Their Awareness of SSIs

Table 13. Participants' Views of Effect of Jigsaw Method on Their Awareness of SSIs

Themes	Codes	Participants
Positive Effects	Increasing my knowledge	Ayça, Didem, Erva, Gülçin, İlayda, İbrahim, Kevser, Yeliz
	Arousing interest	Berna, Davut, Erva, Esra, Eda, Orhan, Yeliz
	Encouraging further inquiry	Berna, Erva, Esra, Eda, Kevser
	Attracting attention	Berna, Orhan, Yeliz, Melih
	Making me more sensitive	Berna, Davut, Erva
	Changing my perspective	Didem, Gülçin, İlayda
	Caring	İbrahim
	Arousing curiosity	Esra
	Staying up-to-date	İbrahim

Participants' views of the effect of the jigsaw method on their awareness of SSIs were grouped under the theme of "positive effects" consisting of the codes of "making me more sensitive," "Arousing interest," "encouraging further inquiry," "increasing my knowledge," "staying up-to-date," "caring," "arousing curiosity," "attracting attention," and "changing my perspective." The following are direct quotes from participants:

> *Erva:Yes, it has. It's got my interest. I only knew a little about those issues. It's made me realize that I should be more curious and sensitive about socioscientific issues.*
>
> *(Making me more sensitive)*

> *Berna: Yes, it has. It's made me realize that we should be more interested to learn about socioscientific issues and that we shouldn't be just content with what we know but instead learn more.*
>
> *(Arousing interest)*

The fourth interview question was "What kind of effect do pre-service teachers think the jigsaw method has on their social skills?" Fifteen participants were interviewed. Figure 8 and Table 14 show the results.

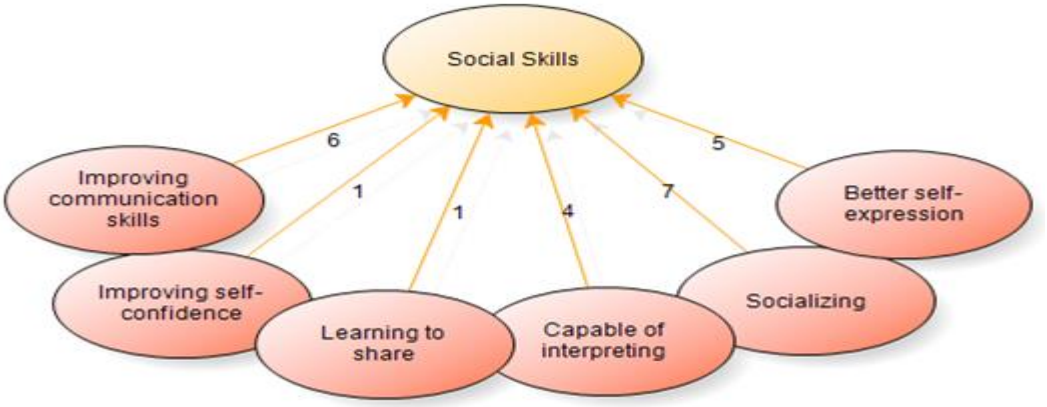

Figure 8. Participants' Views of Effect of Jigsaw Method on Their Social Skills

Table14. Participants' Views of Effect of Jigsaw Method on Their Social Skills

Themes	Codes	Participants
Positive Effects	Socializing	Didem, Eda, Gülçin, İlayda, Kevser, Orhan, Selin
	Improving communication skills	Berna, Didem, Esra, Eda, İlayda, İbrahim
	Better self-expression	Ayça, Davut, İbrahim, Kevser, Yeliz
	Capable of interpreting	Davut, Ayça, Erva, Melih
	Improving self-confidence	Erva
	Learning to share	Selin

Participants' views of the effect of the jigsaw method on their social skills were grouped under the theme of "positive effects" consisting of the codes of "improving communication skills,""improving self-confidence," "better self-expression," "learning to share," "capable of interpreting," and "socializing." The following are direct quotes from participants:

> *Eda: Yes, it has. Now I can talk to people I wouldn't normally talk to, so I've made new friends.*
>
> *(Improving communication skills)*
>
> *Melih: We now know more about the issues, and we can do research about them, so, we got to express our opinions about them.*
>
> *(Better self-expression)*

Conclusion and Discussion

The quantitative results showed no statistically significant difference in SATSI pretest scores between the groups, suggesting that they all had similar attitudes towards SSIs before CLMs. There was also no statistically significant difference in SATSI posttest scores between the groups, indicating that CLMs had no effect on participants' attitudes towards SSIs. Within-group differences between SATSI pretest and posttest scores were tested for normality. The mean differences for the jigsaw and control groups were normally distributed, and therefore, a t-test was used for analysis. However, the mean difference for the learning together group was not normally distributed, and therefore, the wilcoxon signed ranks test was used for analysis. The learning together group and control group participants did not have significantly higher SATSI posttest scores than pretest scores, suggesting that the learning together method and the conventional teaching method did not improve participants' attitudes towards SSIs. However, the jigsaw group participants had significantly higher SATSI posttest scores than pretest scores, suggesting that the jigsaw method improved participants' attitudes towards SSIs. This is probably because the jigsaw method is one of

the most effective methods for teaching about issues with different dimensions (Tekbıyık, 2015) and also because, during the implementation of the jigsaw method, expert groups were created, the issues were meticulously analyzed, and participants discussed the issues and exchanged information. There is little research on the effect of CLMs on people's perceptions of SSIs. We, therefore, believe that this study provides insight into the relationship between CLMs and SSIs. The qualitative results also support our quantitative results.

In the qualitative stage, the learning together group and jigsaw group participants were interviewed to determine their views of the effect of CLMs on their attitudes towards SSIs. Most of them held positive views. There was only one participant who expressed negative views. He stated that he grew a dislike for SSIs because he stated that he found out that SSIs had damages as well as benefits. They stated that all discussions and exchange of information changed their perceptions of SSIs and made them more interested and responsible for them and motivated them to learn more about those issues. For example, Mert stated, "Yes, it has because it has both increased my knowledge and aroused my interest. It was the first time I got offline and went to a library." This might be due to the fact that the CLMs promotes exchange of information and further inquiry, changing students' perceptions and encouraging them to do more research and learn more. The participant who expressed negative views stated that the jigsaw activities made him think that the risks of SSIs were greater than their benefits. The others stated that the jigsaw activities facilitated group discussions and captivated their attention and interest, and encouraged them to do more research and learn more about SSIs. They found SSIs useful and stated that they believed that learning about them was necessary to find solutions to those problems. For example, Kevser stated, "It definitely has. Now we know more about SSIs, and I have firmer opinions and more answers to the questions in my mind. We can now participate in group discussions more easily because we know a lot more about the issues." This is due to the fact that the jigsaw method motivates students to learn more about issues and discussion norms, teaches them to respect other peoples' opinions, and helps them develop positive attitudes towards school and other students (Holm, Schultz, Winget & Wurzbach, 1997; Kıncal, Ergül & Timur, 2007)

In the qualitative stage, participants were interviewed to determine their views of the effect of CLMs on their awareness of SSIs. The interview results showed that the learning together and jigsaw methods raised participants' awareness of SSIs. The learning together participants stated that the method encouraged them to do more research and learn more about SSIs, made them more sensitive and responsible for them, and changed their perceptions and increased their interest in them. For example, Filiz stated, "Yes, it definitely has. The things I've learned have made me more curious. I did research on some issues even though it wasn't homework or anything. I checked out the news and saw some documentaries." The jigsaw group participants stated that the method helped them change their way of thinking about SSIs, sparked their interest and raised their awareness of SSIs and made them more actively involved in the process of finding solutions to those issues. They also stated that the method encouraged them to do more research and learn more about SSIs and made them more curious about them and more willing to stay up to date about them. For example, Belma stated, "Yes, it has. It's made me realize that I should be more interested to learn about social issues and that I shouldn't be just content with what I know but instead learn more." The jigsaw method raised participants' awareness of SSIs because it encouraged them to approach the issues from different perspectives and got them to engage in peer learning activities, andfacilitated discussions and exchange of information (Arslan, 2016; Özdoğan, 2010).

The results also showed that the learning together and jigsaw methods helped participants develop social skills. The learning together participants stated that the method helped them develop communication skills and express themselves better, enabled them to learn more and thus talk about things they were not particularly interested in before, made them more social and confident than before, and provided them with

the opportunity to make new friends. For example, Filiz stated, "Yes, it has. Before then, I had a hard time using my gestures and expressing myself, but now I think that it's helped me overcome that problem." This is due to the fact that CLMs helped participants to express themselves better, take a more active role in group activities, share their achievements, respect other people's opinions, help one another, and find solutions to problems (Bozkurt & Bozkurt, 2008).The jigsaw group participants stated that the method made them more confident and social, allowed them to make new friends and thus develop social skills, and made them more capable of exchanging information with their classmates, and analyzing issues and expressing themselves. For example, Eda stated, "Yes, it has. Now I can talk to people I wouldn't normally talk to, so we've made new friends." This is due to the fact that the jigsaw method encourages students to think more about issues and interact more with their classmates and enables them to express themselves better (Gürbüz, Çakmak & Derman, 2012). Overall, our results indicate that CLMs help students develop social skills, which has been reported by previous studies (Baleghizadeh, 2012; Waiganjo, Mwangi, Ngesa & Kirui, 2015; Arslan & Zengin, 2016).

Recommendations

In the light of the results, it is recommended that the jigsaw method, which is one of the CLMs, be used to help preservice teachers develop positive attitudes towards SSIs. Different types of CLMs can be used to teach SSIs to the students of different departments of education faculties. Future studies should investigate the effects and benefits of CLMs on students' awareness and attitudes towards different SSIs and on their social skills. Similar studies with students of different grade levels and different levels of education should be conducted to compare with our results.

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