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Full Length Research Paper

The influence of worksheets on agricultural students' conceptual growth: An evaluation

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The objective of this study is to determine the effectiveness of the agricultural model supported with worksheets developed by the researchers based on the 5-E model of constructivist learning theory, taught as an elective course in the second grade of the primary school, on students' conceptual developments. For this purpose, a semi-experimental research method was used. While the experimental group consisting of 29 students was taught with the developed agricultural module, the control group consisting of 19 students was taught with the teacher's own lesson materials. It was seen that although the pre-test results obtained from the Conceptual Perception Test were very similar to each other, at the end there was a remarkable difference ($t_{(46)}= 3.472$: $p< 0.05$) in terms of the experimental group results. We see from the results that the students who took the agriculture course via the developed agricultural model become more successful and teaching materials within the developed model has an effect in developing students' conceptual understanding of the agricultural concepts at the six level curriculum programmes.

Key words: Agricultural education model, primary education, constructivism, agricultural concept development.

INTRODUCTION

Agriculture and environment are intertwined and they are interrelated concepts which affect each other. One change in one of them affects the other. Recent researches show that the source of many environmental problems is related to agricultural production applications (Graves et al., 2004; Poudel, 1999; Poudel et al., 2001; Poudel et al., 2005). We need to design and develop agricultural and environmental educational programs considering holistic and social benefits, especially including students, both to increase the awareness of people about agriculture and environment, and to help people to understand environmental and agricultural concepts better (Orr, 1992; Reith and Blakewood, 2002). These need for agricultural and environmental educational programs are not very recent. Many researches emphasize the importance of teaching the subjects about agriculture in different class levels.

Among the scientists doing research on this subject, Fritz and Moody (1997) stress that literate people in agriculture will be important people to play great roles about agriculture in society as the decision mechanism of a nation or politicians of the future, even if they do not build a career in agriculture. However, having been done since the second quarter of the twentieth century, lots of researches (Fox, 1932; Shively, 1936; Herr, 1968; Wolfson, 1970; Keenan, 1970; Shepard, 1970; Swan and Donaldson, 1970; Snowden and Shoemake, 1973; Lucht, 1993; De Christopher, 1993; Peterson, 2008) reveal that

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there is a need for environmental and agricultural education in primary school education.

Covering agricultural subjects in educational programs attracts the attention of students and teachers. Agricultural subjects provide opportunities to students to recognize the concepts in conflict with each other and to transfer them into the real life (Balschweid and Thompson, 2002; NRC, 1998). Lynch (2000) have revealed that students can learn better when they find out the connection between what they will learn and how they will apply what they have learned into real life (Çepni, 2007). The student-based education which creates real learning environments and develops the connections in brain (Lynch, 2000) stipulates the reflection of problems met in daily life into the content intensively. One of the courses in which life and course content are closely connected is "Agriculture", which is suggested to be managed by science and technology teachers (M.E.B., 2006). Although it is an elective course, agriculture course enables us to form a ground on which environmental awareness can be developed about environmental problems, one of the most significant problems in our rapidly changing, developing and polluted world. Besides, agriculture course makes it easy to understand the reasons and connection between agricultural and environmental problems, generally either understood very little or often neglected (Poudel, 2005). Because of this, it is necessary to create environments which will increase the motivation of students and make them active in these courses. In other words, agricultural and environmental education should include the elements which help behavioral changes, increase cognitive development and personal motivation and improves students' skills to interact in a social environment by observing necessary procedures and processes (MEB, 2006).

Importance and justification of the research

As it is known, teachers have to deal with many difficulties when they meet a new teaching program (Bacanak, 2008). The teachers who have a positive attitude about the point that agricultural subjects should take part in new teaching programs, have also met this kind of problems (Wantaabe and Huntly, 1998). According to Lehman (1994), the two of these difficulties are that teachers have the lack of time and they do not give much importance to material development. However, Beanes (1995) points out that most teachers are afraid to teach a subject, very new for them. These findings are also supported with Mason's study (1996). Mason has shown that most teachers do not know how to organize themselves to cooperate about the integration of teaching programs.

In 2006 National Education Ministry rearranged the primary objectives of Agriculture Course Teaching Program as "to make 6, 7 and 8th grade students conscious about agriculture, help them to make comments on different agricultural applications" (MEB, 2006). Through agriculture course, it is focused to make students perceive the importance of agriculture in terms of individuals, society and humanity as well as to make them gain technical information about agriculture. Again through this course the principles of agricultural production, the role of agriculture in the historical development of civilizations, the position and importance of Turkey in the universal agriculture, the sustainable use of agricultural sources, the importance of agricultural raw materials (principally food) in the formation of daily products and the role of technology in agricultural production are aimed. In the light of this basic information it is the vision of the program that students can understand agriculture by a contemporary viewpoint and perceive currently valid agricultural applications (MEB, 2006).

The final objective of Agriculture Course Teaching Program included in the new primary education program is to educate the human model the current age has required by considering the needs of the country and individuals. In other words, by means of agriculture course as assigned as an elective course for the 6, 7 and 8th grades, it is aimed to guide young individuals who are literate about agriculture, conscious about agriculture, although they are not basically agriculture applicators, aware of the importance of agricultural life and also have enough equipment for agricultural applications (MEB, 2006).

Learning by experience increases students' interest for environment and develops their skills to solve problems (Ballantyne et al., 2001). Through agricultural and environmental learning, students develop skills for positive attitudes in agricultural and environmental matters, problem-solving skills and scientific thinking skills (Mabie and Baker, 1996; Osman, 2010). Positive attitudes and critical thinking about the complexity of these problems help students to learn more about agricultural and environmental issues. The interactions between students, teachers and scientists are very helpful to determine problems and develop critical thinking (Kim et al., 2002). There are various studies about the features of worksheets that they increase the students' success and their attitudes for the lesson. (Kurt, Akdeniz, 2002). Most of these studies were planned theoretically or generally. It is a well known reality that these worksheets should be taken into account at primary education level by subjects (Er Nas et al., 2007). The studies about worksheets on 5E models showed that the students were more successful by using worksheets, worksheets provide the conceptual improvement, remediate students' misconceptions, provide the retentive conceptual learning, change the students' attitude

according to the science positively, provide scientific process skills and increase the students' discernment (Keser, 2003; Wilder and Shuttleworth, 2004; Çepni, 2007).

Objectives

The aim of this study is to determine the effects of worksheets prepared according to 5-E model based on constructivist approach on the conceptual development of students interested in the module of agriculture studied as an elective course in the second grade of the primary school. While prepared activities at the hand of teachers are applied to the experimental group, the activities suitable for 5-E model developed by teachers are applied to the control group.

METHODS

To evaluate the effectiveness of prepared worksheets a semi-experimental method was used with a pre-test, post-test and a control group (Robson, 1998; Kaptan, 1998; Karasar, 1999; Büyüköztürk, 2005; Çepni, 2007). While the experimental group consisting of 29 students was taught with the developed agricultural module, the control group consisting of 19 students was taught with the teacher's own lesson materials. The semi-experimental method is an experimental research approach in which it is not possible to assign the persons to experiment and control groups through random distribution (Campbell and Stanley 1963). This method usually entails studying on multiple samples over a long period of time. The most striking difference between classical and semi-experimental methods is that the groups are not randomly formed but on the basis of measurements in the latter, while the former does that in a random manner. The reason why the present study prefers the semi-experimental method is that, as it is performed in a natural environment, it has a higher external validity compared to other methods. Furthermore, the experimental method could be employed in studies aiming to determine cause-and-effect relationship by examining a factor, and then to compare and measure the results. However, studies using the semi-experimental method do not have such limitations (Aydin, 2007).

A more general study was needed, as this study, experimental and control groups were formed randomly (Thistlethwaite and Campbell, 1969) and acquisitions from the research are different from each other, so a semi-experimental method was used. The conceptual development as a result of education in control groups was determined by a consideration of differences between the pre- and post-tests in agriculture module. We tried to determine the direction of the development by categorizing students' answers for all question articles in the test. To determine the effective or missing aspects of education process and materials and to take the views of the teacher of the experimental group, we prepared interview questions.

Samples

The research was carried out in 6, 7, and 8th classes of "Yüzüncü Yıl and Fevzipa a" primary schools, situated in Akçaabat, a district of Trabzon, thanks to the permission obtained from Trabzon Provincial Directorate of National Education autumn semester of 2008-2009 education year. One branch was chosen from the 6th grades in two different primary schools and experimental and control groups were determined from these branches haphazardly. Pre-test and post-test were done in the experimental (29) and control groups (19) before and after the application and then results were evaluated.

Data acquisition

To obtain the data about the conceptual development of students in this study "a Conceptual Perception Test in Agriculture Module" was developed (Ha ıloğlu, 2009).

The conceptual perception test for agriculture module is a test made up of two phases in which students can mark one of true or false alternatives or they can give the explanations of the alternatives they mark. The questions in the conceptual test were examined by field experts. Necessary changes were made upon the questions in the direction of experts' suggestions and they were examined by science and technology teachers. Following these studies, conceptual perception test for agriculture module, made up of twenty (20) questions, took its final shape. A pilot application related to the prepared conception test was applied on ninety (90) students in the 6th grade of a different primary school. The aim is to determine whether students have difficulty in understanding the questions asked in the test and to determine the duration necessary to answer to questions during this application.

After the pilot study of conceptual test was done, the presence of some unclear expressions not understood by students such as "organic destruction" was determined and they were corrected. The teacher of the experimental group was asked about the process of the new agriculture course program and his anxieties in the interview at the end of the application. On the other hand, the interviews done for this study was recorded by a sound recorder and then they were transformed into written documents.

Data analysis

In the conceptual perception test in agriculture module the data obtained from each question were analyzed by two- stage and open-ended questions. In the evaluation of two-stage questions, in the first phase correct answers were given one (1) point, while an answer was looked for to the question "Why" in the second stage. Wrong answers and reasons including misconceptions are given 0, unclear expressions are given 1 point, unsatisfactory expressions and middle explanations are shown by 2 points, satisfactory expressions and good explanations by 3 points and satisfactory expressions and very good explanations are worth 4 points (Tables 1a and b).

Apart from the above-mentioned, simple percent calculations and comparisons, data obtained from the pre-test and post-test were also statistically analyzed. For a total evaluation of executed education total scores all students took from the test were figured. As it was mentioned in the grading of the test, the highest point students can take 100 when they answer to all questions in the test. While the comparison of experimental and control groups within themselves were done through dependent t-test, independent t-test was used in the comparisons among groups. The relation between the pre-test and post-test applied in the experimental group was analyzed by T-tests.

Students' answers to the first question in the first image are graded by means of the rubric in Table 2.

According to the students' scores figured by means of the rubric in Table 2, the conceptual development levels of students in the

Table 1a. Levels used to figure out the scores of students in the test of conceptual perception about agriculture module.

Levels	Grades
Satisfactory expressions, very good explanations	4
Satisfactory expressions, good explanations	3
Unsatisfactory expressions, middle-level explanations	2
Unclear expressions	1
Wrong expressions	0

Table 1b. The first question in the test of conceptual perception about agriculture module.

1- Natural (organic) agriculture provides us some benefits	
True ( )	False ( )
Because	

Table 2. Rubric for the first item.

Scores	Perception levels	Students' answers 1
4	Satisfactory expressions, very good explanations	It provides more natural and unhealthy food because unhealthy products are not used in organic agriculture and it does not damage environment. Chemical products are not used in farm products thanks to organic agriculture. The products not including hormone and medicine are used. It protects environment.
3	Satisfactory expressions, good explanations	Products are grown naturally in organic agriculture. Medicine is not used. Organic agriculture is more useful for our health. Hormons and medicine are not used in soil.
2	Unsatisfactory expressions, middle-level explanations	Organic agriculture is significant for our health. Organic agriculture is useful because it is not harmful.
1	Unclear expressions	Organic agriculture is useful. Organic agriculture is good.
0	Wrong expressions, reasons including misconceptions	Organic products are not natural. Organic agriculture is not useful.

pre-test and post-test and the percent of the students on these levels and the numerical percent of these students are shown in Table 3.

At the planning stage it was decided that acquisitions in the agriculture module of Agriculture Course Education Program should be studied in accordance with the constructivist learning theory. Therefore, national and international studies were scanned about the subject, considering the acquisitions in "Agriculture" module in the new teaching program. As the program is very new, national academic studies could not be found about the research topic. International literature was scanned in accordance with the acquisitions about agricultural education realized according to the

Tablo 3. Percentage Distribution of E and C groups' answers in the pre-test and post-test related to the first item in the perception test about agriculture.

Item		KGD	Pre-test Number (N)	Pre-test Percent (%)	Pre-test Total (%)	Post-test Number (N)	Post-test Percent (%)	Post-test Total (%)
E group	Poor	0*	1	3.44	34.48	3	10.34	20.68
		1	9	31.03		3	10.34	
	Mediocre	2	7	24.13	24.13	6	20.68	20.68
	Good	3	6	20.68	41.36	8	27.58	58.61
		4	6	20.68		9	31.03	
		Total	29	100	100	29	100	100
C group	Poor	0*	5	26.31	36.83	2	10.52	31.57
		1	2	10.52		4	21.05	
	Mediocre	2	6	31.57	31.57	6	31.57	31.57
	Good	3	3	15.78	31.57	3	15.78	36.83
		4	3	15.78		4	21.05	
		Total	19	100	100	19	100	100

Table 4. The comparison of the pre-test scores of control and experimental groups by independent "t" test in the test of conceptual perception about agriculture module.

	Group	N	Average	S. deviation	sd	t	P
Pre-test	Control group	19	40.15	11.15	46	0.337	0.737
	Experimental group	29	38.96	12.47			

Table 5. Dependent "t" test results of both groups in relation to their pre-test and post-test scores.

		N	Average	S. deviation	Sd	t	P
Control	Pre-test	19	40.15	11.15	18	-2.72	0.014**
Group	Post-test	19	44.26	11.62			
Experimental	Pre-test	29	38.96	12.47	28	-9.87	0.000*
Group	Post-test	29	60.24	17.67			

(**p<.05, *p<.01).

constructivist educational program.

RESULTS

According to the pre-test results applied to compare the success of experimental and control groups before the application, there is not a significant difference among groups ($t_{(46)}$ =.337: p>0.05). When pre-test averages are considered ($X_{experimental}$ = 38.96; $X_{control}$ = 40.15), it is seen that both groups are close to each other, but the average of the control group is a little higher than the experimental group (Table 4).

In Table 5 we can see the comparison of the pre-test and post-test scores of the control group by "t" test. It is remarkable that the post-test average of the experimental group is nearly 16 points higher than the post-test average of the control grup.

It is observed that there is a considerable difference among the tests, in dependent "t" tests done to see the

Table 6. Independent “t” test results of groups, related to the post-test scores in the conceptual perception test of agriculture module.

	Group	N	Ort.	S. Sapma	Sd	t	p
Son-test	Kontrol Grubu	19	44.26	11.62	46	-3.472	0.001
	Deney Grubu	29	60.24	17.67			

(**p<.05, *p<.01).

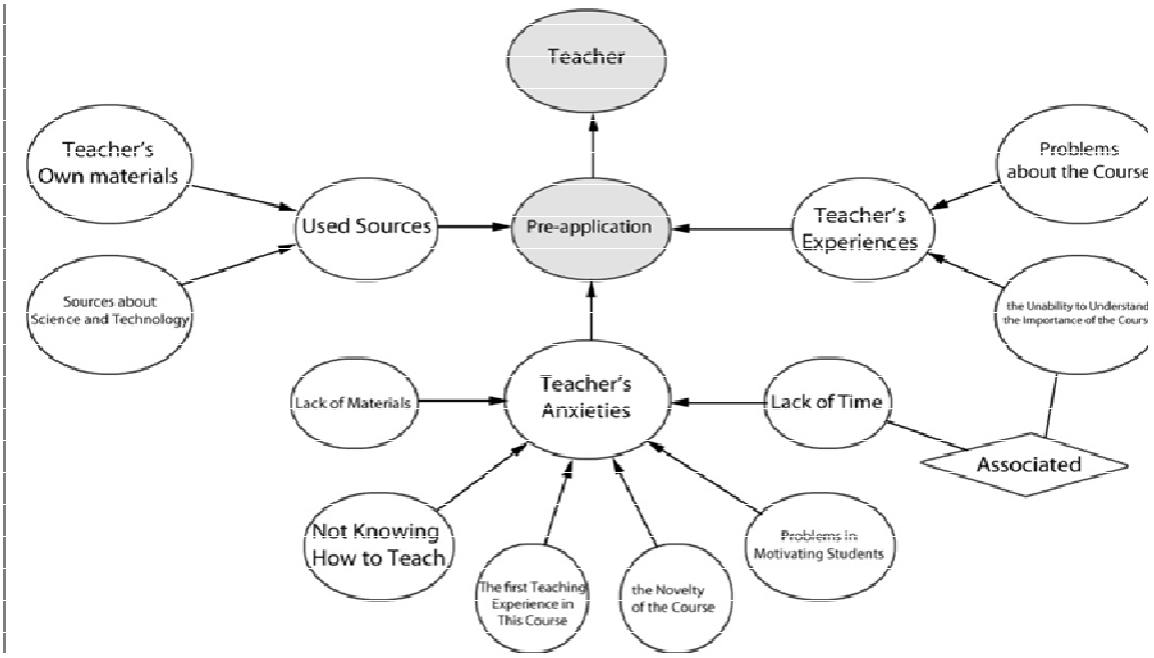

Figure 1. The sources the teacher used during the agriculture course before the application, his experience and anxieties.

relation between the pre-test and post-test success test scores of the control group ($t_{(18)}$ = -2.72: p<0.05). This difference is to the advantage of the post-test. Students are much more successful in the post-test than the pre-test. It is outstanding that the post-test average of the experimental group is nearly 21 points.

The comparison of the post-test scores of the experimental and control groups with the independent “t” test is shown in Table 6, depending on Agriculture Conceptual Test.

According to the independent “t” test results to compare the post-test scores of the experimental and control groups after the application, it is seen that the experimental group is more successful than the control group ($X_{experimentel}$ = 60.24; $X_{control}$ = 44.26) and there is a considerable difference between them ($t_{(46)}$ = -3.472: p< 0.05). In other words, when teachers use prepared worksheets, we can say that the conceptual development of students has increased remarkably.

Findings obtained from the interviews with the teacher

In the context of this study an interview was done with the teacher of Agriculture course who works in the school where the application was executed about the developed materials and the process of application at the end of the application. In the context of this interview answers given to the relevant questions were evaluated sometimes separately for each question, sometimes all together and we tried to present them as obtained codes and models.

Could you give us some information about the process and your anxieties about this subject before the developed and applied materials for the agriculture course are put into practice within the context of this study? This question was asked in the interview with the teacher and the model formed as a result of encoding about the answers to this question is illustrated in Figure 1.

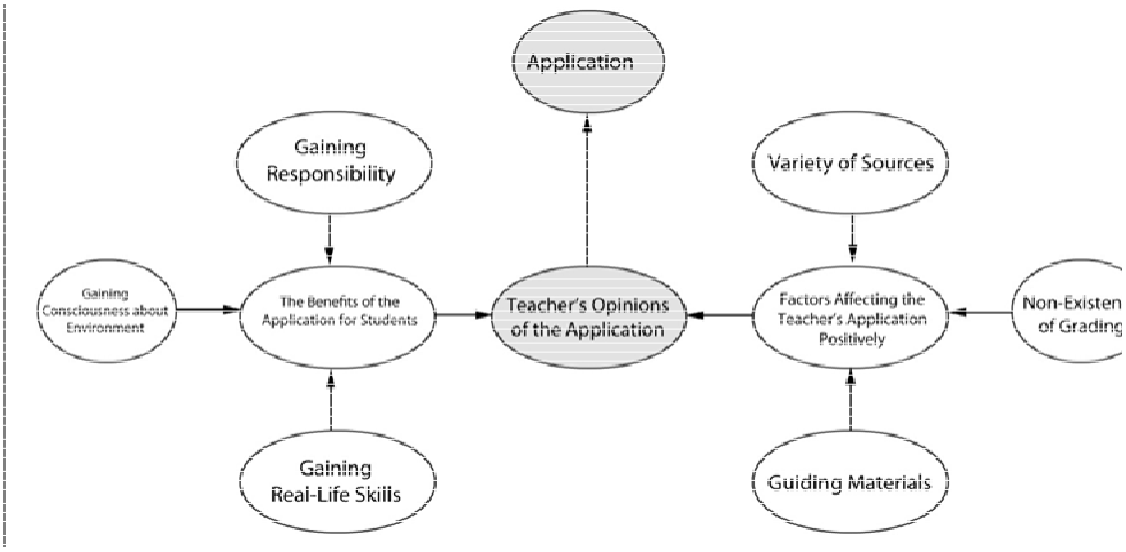

Figure 1. The opinions of the teacher about the application.

The teacher of the experimental group (ET): This course is elective. It is a weekly one-hour course. Hence at first students did not regard this course as a significant course. In this sense it was a big problem for us. Besides, it was the first time I had ever taught this course. It was a new experience for me. I had much difficulty about this course in the former period. When we talked to you before, I had told you I did not have any course book and materials and I did not know what to do. Therefore I resorted to science and technology books, various sources and the materials I prepared myself during classes. I did not have a lot of problems during the teaching process we managed with you together. I had thought it would be harder for me to deal with students, but it did not happen so. On the contrary, students enjoyed it a lot. It attracted their interest. When I handed out the worksheets, they started to look at the pictures immediately. It aroused their interest. It was a great comfort for students that elective courses were not graded in their school report. When they were comfortable, they felt freer and expressed their opinions more comfortably. At the same time, the fact that I had the guiding materials and activities you prepared at hand during the course made my job easier. Classes were very productive. It made me happy that students were active during classes. I liked the materials very much, as they were suitable for students' levels. That is, students did not have much difficulty in activities and they completed them with pleasure. Moreover, students enjoyed the school garden project we carried out in the last weeks a lot. They like the classes covered in the garden too much, so we had a nice time during the applications of this course. Thanks to these applications students gained more consciousness about environment and their sense of responsibility increased more. They obtained some skills they can use in the later period of their life. Even the quietest students became more active.

As it is observed in Figure 1, the encoding about the sources the teacher used during the agriculture classes before the application, about his experience and anxieties are categorized under three different titles such as "Used Sources", "the Teacher's Experience", and "the Teacher's Anxieties". It is clearly seen in Figure 1 that the teacher benefited from the materials he prepared for this course himself or from the sources prepared for science and technology classes before the materials developed within the context of this study were put into practice. However, it is understood from the encoding under the title "the Teacher's Anxieties" that the teacher had the lack of materials, lack of enough hours, the course is very new, the teacher did not know how to teach this course and he had some anxieties how to motivate students.

The model formed as a result of the encoding about the answers to the question "What could you tell us about the developed and applied materials for the agriculture course and the process of teaching in the context of this study?", asked during the interview with the teacher within the context of this study, is illustrated in Figure 3.

(ET): The availability of materials increased students' interest in this course and accordingly it increased their participation. Even my quietest student during classes tried to do something, which made me surprised. Students were always eager to strive for something and the interaction among groups was very developed. They desired to share strongly. I can clearly say that these materials left very positive effects upon students. I also liked them very much and think they are very useful.

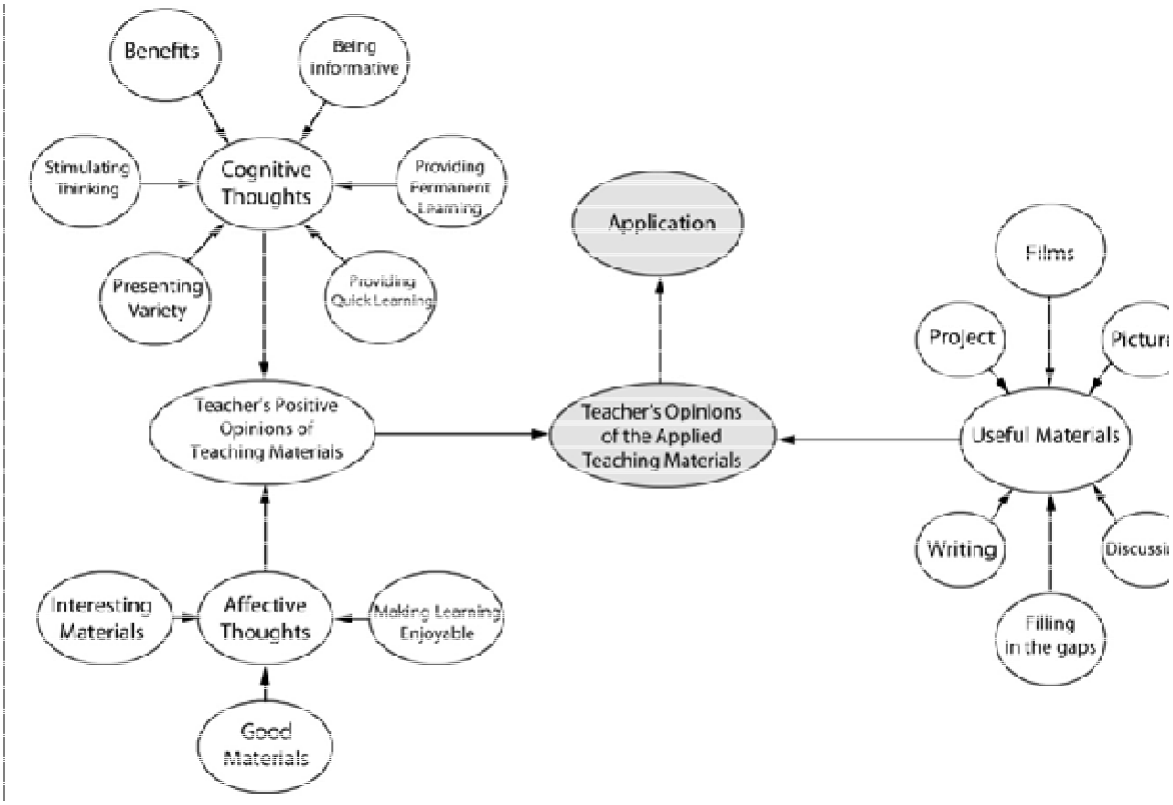

Figure 3. The opinions of the teacher about the applied teacher's guide materials.

As shown in Figure 2, the codes as regards to the opinions of the teacher about the applications during the agriculture course are illustrated under the titles "the benefits of the application for students" and "the factors affecting applications positively".

The model created as a result of the codes and subjects obtained from the answers to the questions "what do you think are the positive aspects of the developed and applied materials for the agriculture course within the context of this study? And "which ones are the most useful among the materials you used during the teaching process? asked during the interview with the teacher within the context of this study, is illustrated in Figure 3.

(ET): Teacher's guide materials contribute to the learning process a lot. Students learn more easily and quickly. They feel bored if there are no materials to study on. The effects of visual elements in materials are great. These visual materials draw their attention. They do not forget what they have seen for a long time and they become more permanent in their mind because they are very interested in them. They like this kind of illustrated activities. At the same time, these activities make students think.

The teacher of the experimental group points out that materials made topic clear and understandable and visuals made learning more effective and permanent for students. He mentioned that these activities left a positive effect on students.

As shown in Figure 3, the codes related to the opinions of the teacher about the applied teacher's guide materials are illustrated under the titles "Teacher's Positive Opinions of Teaching Materials", and "Useful Materials". While the codes "Being Useful", "Being Informative", "Providing Permanent Learning" and "Providing Quick Learning", "Stimulating Thinking" and "Adding visuals" take place under the subtitle "Cognitive Opinions" under the title "Teacher's Positive Opinions of Teaching Materials", the codes such as being "Interesting Materials", "Making Learning Enjoyable", and "Good Materials", are under the subtitle "Affective Opinions".

"What are the benefits of the developed and applied materials for the agriculture course to students within the context of this study? What are the difficulties you met during the applications of the materials developed for the agriculture course within the context of this study? And "have you ever realized any deficiencies about the teaching process and the materials? The model created from the codes and themes obtained from the answers to the questions are illustrated in Figure 4.

As it is seen in Figure 4, the codes about the teacher's

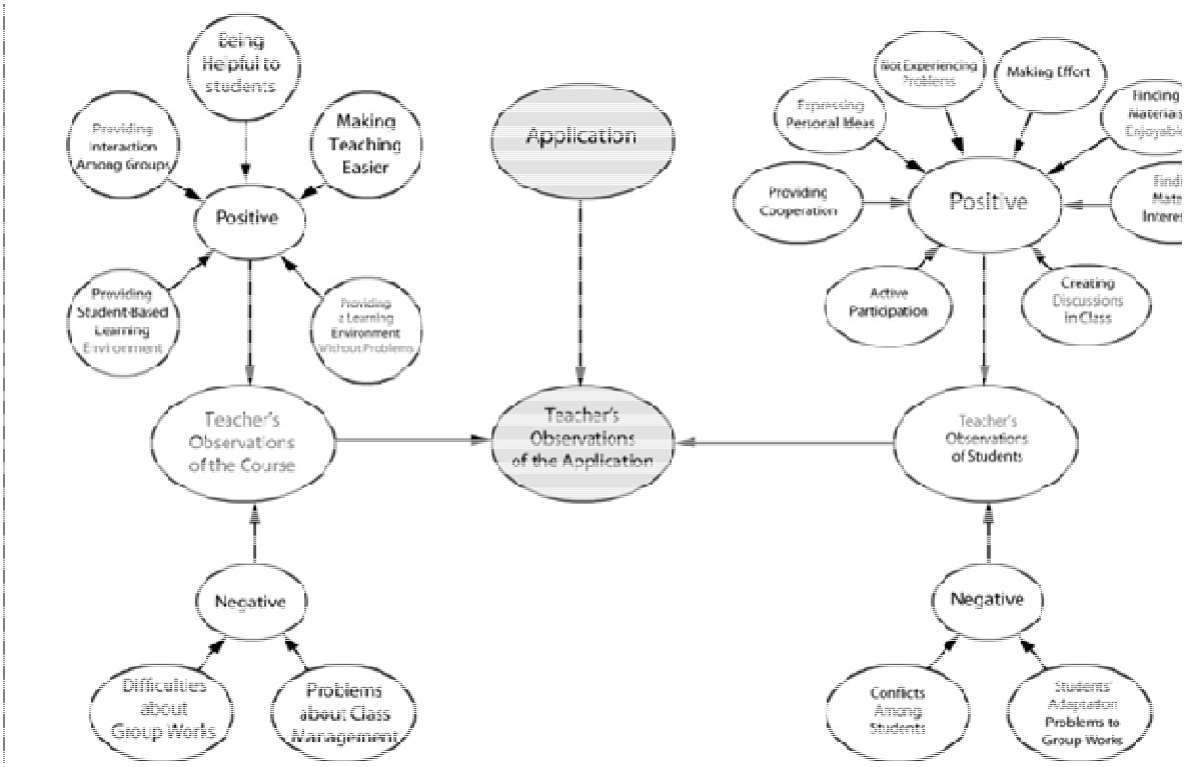

Figure 4. The teacher's observations about the application.

observations of the application are shown under the titles "the teacher's observations about the course" and "the teacher's observations of students".On the other hand, the codes under these titles are under the titles "Positive" and "Negative".

Researcher (A): Which ones were the most useful among the materials you used during the teaching process?

(ET): The activities we used were generally good. Students enjoyed the activities while they were doing them. I liked some of them a lot. Visuals attracted students' interest. In addition to this, I liked the films about some subjects. It is easier for students to learn what they have seen thanks to films. It is also easier for them to remember what they have learned. We struggle hard to teach one subject, but students understand subjects soon thanks to these films. Films arouse their interest and students do not forget what they have seen. We do not have such films at our hand, so I liked them very much. During the leraning process we did activities such as filling the empty boxes, drawing conclusions from visuals, writing after brainstorming and discussions, as well as making students watch films. This variety was good for students. Especially, the applications in the garden enable them to learn by experience. I think positively about these applications we did together. Students enjoy doing things with soil and this makes them learn a lot of things. I think that the materials we used during this course are very useful.

The teacher expressed that he liked the variety of applied activities most. He also revealed that watching films help students learn better and they are more interested thanks to films, activities make them think and the activities and applications about daily life enable them to learn by experiencing.

(A): What is the benefit of the developed and applied materials for the agriculture course for students within the context of this study?

(ET): Students presented their ideas by discussion. They could express their opinions even if they are wrong. They realized their their mistakes by discussing their wrong ideas. Students know something wrong and they discuss it and sometimes they ask me to help them to find who is right. I think it makes learning more permanent. One point that strikes my attention is that students were more active than they were in the first classes. I teach these students also science and technology courses, but they became more active in this class. I cannot discuss with these

students so much in the science and technology classes. Students talked more comfortably in this class and they were more eager. The style of the course was mostly student-based. They were paying attention to use more clear expressions in the discussion of results, so I think discussions are very useful.

The teacher of the experimental group thinks that discussions are very useful. He indicated that students found the right ideas by discussion and they were very active in classes, and all students participated in the lesson. He also added that students improved the expressions they intended to say through discussions.

(A): What are the difficulties you came across during the applications of the developed materials for the agriculture course?

(ET): For example, students wanted to work with their favourite friends in group works. At this point I was stuck. Because they are not used to group works, there were some conflicts among them. They asked me to exclude them from their own group, which led to some disorders in classes, but they started to adopt group work in time and they got used to it. These problems decreased in time and group work started to become more useful. As all students wanted to talk in discussions, there were lots of noise.

The teacher indicates that students were not disciplined at first because they were not used to group works, but this problem was solved in time. He explained that it worked very well to the advantage of students when they adopted group works.

(A): Did you ever come across any deficiencies related to the materials and the teaching process?

(ET): No, I did not. Everything went good. Thank you very much for the materials you prepared. They were very useful. As I mentioned before, I had some anxieties because it was the first time I had ever taught this course. I did not know what to do. The materials you prepared were quite good. I could not find any missing parts. Anyway, we had examined the materials together before, so I thank you very much.

(A): I also thank you very much for your contributions.

The teacher of the experimental group said that there were no shortcomings in the materials and these materials were great help to him during classes.

DISCUSSION

In the light of obtained information it is seen that there is not a significant difference between groups in terms of success before starting the application. This situation proves the suppositions that the success levels of students in the experimental and control groups are very close to each other.

Again according to the findings it is observed that there is a great increase in the success levels of conceptual understanding levels of students at the end of the application, compared with their former levels before starting the application. When the post-test scores of students are examined, it is noticed that the experimental group is much more successful than the control group. The results of “t” test between pre-test and post-test show that there is a significant difference in favor of the post-test.

When the final situation is analysed considering the findings, it is concluded that teachers should have some prepared sources to give students to teach the terms and concepts about agriculture better.

We can say that there is a great increase in students’ success when teachers have prepared worksheets at their hand. As it is known, teachers express that they have difficulty in preparing activities because of the density of their teaching programs. Therefore, if teachers do not have prepared materials they can use in class comfortably, they will probably not prefer this elective course in the program.That prepared materials are not available in the new program and they are expected to be prepared by teachers will create this result.

That prepared materials for this course include group discussions, a discussion environment is created with the interesting questions attracting students’ attention, the content of reading texts, will make it possible even for passive students to participate in classes actively during the application of the agriculture program. This case shows that the materials used in the program have attracted students’ interests sufficiently and enables students to follow classes without feeling bored, but with pleasure. The covering of interesting and engaging activities for students can be helpful to stimulate students’ interests in classes. Focusing on the interesting aspects of subjects may increase their motivation for classes.

Even if an education suitable for 5-E model in the constructivist approach are presented in both of the experimental and control groups, if teachers does not have an effective worksheet and they are expected to prepare worksheets, it can be concluded that the conceptual development of students, and accordingly their success in classes decrease according to prepared worksheets.

As applied materials will provide benefits to students and teachers in many respects, they can be said to be sample materials intended for this course. That application results are positive shows that the education realized through prepared materials reached its aim and there is a need to this kind of materials. However, the

anxieties teachers feel are the lack of materials, the lack of time, the novelty of the course, ignorance about how to teach this course and the question how to motivate students.

During the interview the teacher of the experimental group pointed out that materials made his job much easier during classes, activities attracted students' interest, activities are clear, understandable and enjoyable at the same time and this enabled students to be more active in class. As a result of this, the worksheets prepared before helped the conceptual development of students to increase remarkably.

The teacher expressed he liked the variety of activities most. He explained that watching films made learning much easier for students, students became more interested thanks to films, activities made students think and activities are about daily life and applications drove students to learn by experience.

The application teacher indicate was that he had difficulty in finding or developing activities, so that teachers were presented with prepared materials that gave them great comfort during applications and enabled them to gain most of the features a constructivist teacher should have.

As it is noticed in the results of the research realized, it is seen that there is a remarkable increase in the conceptual development of students from the experimental group about agriculture in the discussion environments where prepared worksheets used. The increase in the conceptual development of students stem from the fact that the constructivist approach was applied effectively in learning environment and the necessary instructions were given to students to help them in activities. Thus there is a need to develop materials suitable for teaching programs based on the constructivist approach in the application of agriculture education.

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APPENDIX

Cognitive Development Test in Agricultural Module

Name: *Surname:* *Gender:* *Female ( )* *Male ( )*

1. Natural (organic) agriculture provides us some benefits.

True ( ) False ( )

Reasons:

2. Agricultural activity means only cultivating the land and growing up plants.

True ( ) False ( )

Reasons:

3. Agriculture and animal breeding are not separate from each other. Animal breeding is directly connected with agriculture.

True ( ) False ( )

Reasons:

4. Scientific and technological developments affect agricultural production negatively.

True ( ) False ( )

Reasons:

5. The best soil type for agriculture land is sandy soil.

True ( ) False ( )

Reasons:

6. There are many rotten animal and plant remnants inside humus soil.

True ( ) False ( )

Reasons:

7. There is no air in the soil.

True ( ) False ( )

Reasons:

8. Less developed countries grow much more farm products than industrialized countries.

True ( ) False ( )

Reasons:

9. Erosion decreases the richness of soil.

True ( ) False ( )

Reasons:

10. Erosion causes soil pollution.

True ( ) False ( )

Reasons:

11. Air and water are two important natural substances necessary for the living creatures in the soil.

True ( ) False ( )

Reasons:

12. The products obtained from ecologic (organic) agriculture are significant for healthy nutrition.

True ( ) False ( )

Reasons:

13. Factories affect farm lands negatively.

True ( ) False ( )

Reasons:

14. Soil does not keep air when it is very wet.

True ( ) False ( )

Reasons:

15. Soil is an ecosystem.

True ( ) False ( )

Reasons:

16. The development of agriculture has been realized thanks to the use of science and technology.

True ( ) False ( )

Reasons:

17. There is not a relation between industrial products and farm products.

True ( ) False ( )

Reasons:

18. Farm products include only food stuff.

True ( ) False ( )

Reasons:

19. Seeds are an agricultural source.

True ( ) False ( )

Reasons:

20. Much more human power is needed in modern agriculture.

True ( ) False ( )

Reasons: