



PRESERVICE TEACHERS' PERCEPTIONS CONCERNING THE MULTIFUNCTIONALITY OF AGRICULTURE IN THEIR MIND MAPSⁱ

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Abstract:

This study aimed at revealing the preservice teachers' mental images about the concept of agriculture and the functions of agriculture contains through mind maps. The images of a total of 60 Mind Maps were obtained by drawing technique. Mind maps were examined by content analysis in MAXQDA© qualitative data analysis program. As a result of analyses performed by utilizing the agricultural literacy themes, it appeared that the images examined in mind maps were under eight main themes viz ecology, food safety and health, food processing, food production and energy, marketing and distribution, culture, geography and climate, economy and politics, science, technology and engineering. While it was seen that descriptions concerning the food areas and ecology theme were at a level that could be regarded as important, preservice teachers did not produce enough images on economy and marketing network issues.

Keywords: mind maps, multifunctionality of agriculture, preservice teachers

1. Introduction

Although the changing and developing world order has brought forth debates and concerns about insufficient and unbalanced nutrition, food safety, drinking water

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reservoirs and many similar topics, and has redefined their functions by directing the crowd of people towards the agriculture fact (Somuncu-Demir & Bahar, 2015). The agricultural sector, is the only discipline that assumed the responsibility to provide food and fiber to people for many years, has extended its scope, and its correlation with many fields from the environment to energy and culture to education that are the components contained in itself has begun to gain importance today. The importance of multifunctionality structure of agriculture arguing that economic, ecological and social aspects are basically evaluated together and should be addressed as a whole inseparably from each other has increased and continued to draw attention today because of its broad scope (Akyüz, 2013). Agenda 21 in Rio negotiations, which was held by international organizations in 1992, demonstrated how the identity of agricultural fact had changed over centuries. The agricultural fact which has been perceived as food and fiber production throughout history has become comprising many fields with which it is associated by becoming different in the face of developing and changing world order, and its importance has been emphasized by a multifunctional structure (Organisation for Economic Co-operation and Development, OECD, 2001). Thus, agriculture now has become a multifunctional structure including fields such as protection of the environment, animal welfare, biodiversity, food safety, and quality. Nevertheless, the importance given to agriculture and environment policies in the industrialized societies is less than a degree that cannot be compared.

Great importance is attributed to education in individual's attitude, behavior, and adaptation to innovation (Rogers, 1995). Considering from this point of view, how preservice teachers perceive the agriculture and food concepts, the importance of which is growing each passing day and which are in a strategic position, seems important to examine. This study is carried out to investigate the preservice teachers' mental perceptions on the concept of agriculture as a consumer and active citizen with mental mapping technique.

2. Method

The research was structured in accordance with the document analysis approach from qualitative research methods as it was aimed to investigate the preservice teachers' mind maps showing the visual and written documents features in the context of the concept of multifunctional agriculture. Film, video, and visual materials are frequently used in the analysis of written materials and document analysis containing information about the facts or facts targeted (Yıldırım & Şimşek, 2006). Mind maps concerning the

agricultural concept drawn by preservice teachers studying in classroom teaching and science teacher departments constituted the analyzing object of the research documents.

2.1. Study group

The study group of the research consisted of a total of 60 preservice teachers studying in Science Teaching (n = 30) and Classroom Teaching departments (n = 30) in Abant Izzet Baysal University where is the located in Black Sea Region that north of the Turkey.

2.2. Data Collection Process and Analysis

The implementation phase of the research was carried out in the 2015-2016 academic year, and preservice teachers were provided with informative training for the application of mind mapping technique including 2 hours for theoretical and 1 hour for application at the beginning of the process. Because the data set obtained from mind maps was very intense in terms of image, the qualitative data analysis software called MAXQDA[®] was used in coding, detection and arrangement of the themes to make data analysis process more open and systematic (Creswell, 2008). The collected data were analyzed by using "content analysis" technique aiming to define data and to reveal the structures that could be hidden within the data (Strauss and Corbin, 1990), from qualitative study analysis methods.

In the first part of the contents analysis, all mind maps were converted to jpg format as a result of the document analysis and transferred into MAXQDA[®] qualitative data analysis program. Each preservice teacher's mind map was installed into the program as separate "documents". The encoding process was performed along with the concept written on each image in the mind maps. Based on the resulting codes, themes that would explain the data in general and group them under specific categories were found. In finding of these themes, analysis categories which were used by Somuncu-Demir & Bahar (2015) in study of identifying the concept of the agricultural literacy were used, and the mind maps providing the data of this study were classified under 8 main themes.

In ensuring the repeatability of the research in terms of coder reliability, the assistant researcher was called upon while determining the images that preservice teachers' mind maps included. After the encoding process performed by researchers at different periods from each other was carried out through MAXQDA[®] program and completed, the first and second encodings were compared and an attempt to eliminate the inconsistencies between them was made.

3. Results

The code map concerning the common themes achieved as a result of analysis of mind maps formed by preservice teachers about the multidimensionality of the concept of agriculture on MAXQDA® is shown in Table 1 and Table 2. It is seen that 8 main themes were formed in images for the multidimensionality of the concept of agriculture. It is possible to examine themes under the themes of (1) *Ecology* (2) *Food Safety-Health and Wellness*, (3) *Food Processing*, (4) *Food Production and Energy*, (5) *marketing and distribution*, (6) *Culture, Society and Geography* (7), *Economics and Politics*, (8) *Science-Technology-Engineering*.

Ecology theme appears as one of the fields in which preservice teachers formed sub-codes at the most. It is seen that agro-ecosystems, which are the ecosystems that have been created by human intervention, were mostly stated as fruit orchards, and that the importance of water ($f=23$) from natural resources was mostly described for water saving and the future. The presence of images that associates agriculture with the future of the world and that refers to the sustainability of the planet ($f=11$), and the availability of images expressing bio-smuggling at the least are quite interesting and noteworthy findings. It can be inferred that activities carried out in cooperation between National Parks and Universities and the issue of bio-smuggling appearing as a public spot in the media had a role in the occurrence of this effect. However, this issue could not take part in the cognitive structures of preservice teachers at the desired level. It is seen that particularly environmental problems from agricultural sources were frequently addressed under this theme. Excess fertilizer ($f=2$) and insecticide use ($f=8$), soil, water and air pollution ($f=10$) are some of them. It was seen that agricultural borne diseases occurring globally such as Crimean-Congo Hemorrhagic Fever were mentioned ($f=4$), even if just a bit. The fact that deaths originating from Crimean-Congo Hemorrhagic Fever experienced in Turkey are more in number, and that the poultry slaughter due to the bird flu was transferred to a wide audience through the media could have revealed this result.

Table 1: Preservice teachers' opinions concerning the agriculture and food fields

Main Category (Theme)	Categories (Code)	Sub Categories	Frequency
1. Ecology	Agro-ecosystems	Fields and Gardens	12
	Sustainable Development	Future And Life	11
	Natural Resources	Land Awareness	10
		Water Awareness	23
	Conservation Of Natural Resources	Forest And Pasture Awareness	8
		Recycling	2
	Compost - Waste	Compost - Waste	1
		Dripping Irrigation	6
	Organic Fertilizer Use	9	
	Biodiversity	7	
	Endemic Species	2	
	Biological Warfare	1	
	Bio-Smuggling	2	
	Environmental Problems	Excessive Fertilizer Use	2
		Insecticide Use	8
		Air Pollution	4
Water Pollution		3	
Soil Pollution		3	
Agriculture Borne Disease		4	
Global Warming		5	
Drought		2	
Improper Use Of Agriculture And Land		6	
Adequate And Balanced		55	
2. Food Safety & Health	Nutrition		
	Food Safety		18
	Obesity		4
3. Food Processing	Processing Period	Processing Period	25
	From Wheat To Bread		19
	Canned Goods		3
	Cotton Clothes		3
Additive Materials		1	

When viewed in general, it is seen that the Ecology theme is rich in images. The fact that there are numerous elective courses associated with the environment that preservice teachers can select from the course pool and that a course associated with the environment is included in compulsory courses may have been effective in the emergence of this result. Especially in Biology, Special Topics Course and Environmental Awareness Course are among the courses focusing on the agricultural issues in terms of content.

The images formed in the field of food are gathered under three headings. Among these, it was determined that the category emphasizing the importance of adequate and balanced nutrition was the most cited heading in terms of image ($f=55$) under Food Safety, Health, and Life Theme. Although preservice teachers mostly described the food safety as clean, healthy and hygienic ($f=18$) food, the fact that there was an imagery on additive agents and that they did not form any image concerning the halal food and food allergy is a remarkable finding. The presence of images addressing the processing period of herbal or animal products obtained, even if it is not directly referred, under food processing heading ($f=25$) was discussed. Under food processing theme, it was seen that while the process of wheat until becoming bread was mostly described to the processing period ($f=19$), there were few imageries concerning the canned goods, processed product ($f=3$). Under Food, Energy, and Production theme, only organic agriculture which is a kind of alternative productions was addressed ($f=10$) from the types of energy obtained by nutrition ($f=11$). It was seen under this heading that preservice teachers mostly described the image of farmer concerning the production ($f=25$) and that great effort and manpower were mostly emphasized in these images. It can be inferred that the activities carried out in order to raise consciousness of food and sufficient and balanced nutrition among elementary and secondary school students such as School Milk Project and Raisin Distribution Program. Also this programs in cooperation with Food, Agriculture and Livestock, Ministry of Education and Ministry of Health in Turkey is the result of the fact that each of the three themes related to food indicated such high frequencies.

Under Marketing and Distribution theme, especially to the import and export images ($f=14$), the attention-grabbing one among them were the images describing the relations with countries such as Russia, the US, and the Netherlands. Under Culture - Society and Geography theme, it was observed that seasonal child workers ($f=5$), the issue of migration from rural to urban ($f=10$) and the intense working class working in the field of agriculture ($f=6$) which are associated with agricultural problems in Turkey's agenda were addressed. The emergence of especially livestock as the main code and the most repeated field ($f=42$) under this theme is remarkable. Besides, it is seen that there are images ($f=20$) emphasizing the varying structure of Agricultural field/land according to the climate and geographical features. It was observed that some preservice teachers described the past experiences in rural spaces ($f=32$). Under Economy and Policy theme, it seems that images describing the duties of the state in the field of agriculture ($f=12$), and images depicting industrialization ($f=8$) and agriculture as an important source of income ($f=22$) were included.

In images for the Science Technology and Engineering theme, images on especially Agricultural Technologies ($f=71$) and GDO images in the field of Genetics-Biotechnology ($f=49$) are intense. Preservice teachers' images included only the simpler machinery mechanisms such as tractors, wagons, harvesters, shovel, pickaxe which are used in herbal-animal production and distribution process under the agricultural technology heading.

Table 2: Preservice teachers' opinions concerning the agriculture and food fields

Main Category (Theme)	Categories (Code)	Sub Categories	Frequency
	Energy for Life		11
4. Food, Energy & Production	Energy sources		2
	Farmer		25
	Production in the farm		19
5. Marketing & Distribution	Alternative Farming	Organic Production	10
	Trade		5
	Import - Export		14
	Transportation - Distribution		3
	Public-Market		5
6. Culture, Society & Geography	Agricultural Country Issues	Seasonal workers, child	5
		Agricultural workers	6
		Migration	10
		Livestock	42
		Life in rural and farm	32
7. Economy & Policy	Climate - Geography- Meteorology		20
	Sheltering		4
	Landscape		14
	Career Awareness		7
	Industrialization - Rapid Production		8
	Source of Income		22
	Role of The State		12
	Economic Development		3
	Agricultural Technologies	Dripping Irrigation System	10
		Grinder	2
8. Science, Technology & Engineering		Tractor-Wagon	27
		Pickaxe-Shovel-Dredge	25
		Harvester	5
		Milking machines	2
		Genetics-Biotechnology -GDO	49

It is clearly seen in Table 1 and Table 2 that the dripping irrigation system ($f=10$), under the heading of agriculture technology, is included under the heading of water saving and conscious irrigation perception and the protection of natural resources. Besides, there were many imageries concerning the concept of Genetically Modified Organisms, the majority of which were negative ($f=47$). The concept of GDO that did not indicate any positive imagery ($f=2$) other than the extension of the product's shelf life was described with different imageries in the manner that would include many misconceptions from cancer to poison, from hormone to death.

It can be inferred that the magazine news with unconfirmed sources concerning the concept of genetically modified organisms included in socio-scientific issues in the field of education which is frequently mentioned by both media and non-governmental organizations on global and country basis has formed this perception in preservice teachers.

4. Discussion and Conclusion

In order to determine the fields and subjects associated with the concept of agriculture in the mind maps formed by preservice teachers concerning the concept of agriculture, 60 documents were examined, and it was concluded that 662 images in these documents were associated with the following themes based on the percentages

- 20% of them ($f=131$) Ecology Theme,
- 10% of them ($f=67$) Food Safety-Health and Life Theme,
- 8% of them ($f=50$) Food Processing Theme,
- 10% of them ($f=67$) Food-Production and Energy Theme,
- 4% of them ($f=27$) Marketing and Distribution Theme,
- 22% of them ($f=148$) Geography Society and Culture Theme,
- 8% of them ($f=52$) Economics and Politics Theme,
- 18% of them ($f=120$) Science, Technology, and Engineering Theme.

Considering the results of the study, it was revealed that the multifunctional structure of the agricultural sector concerning not only in the form of animal and herbal food production but also the issues of ecosystems, natural resources, environmental issues from agriculture, food safety, energy, marketing, rural development and migration, landscape, industrialization and genetic biotechnology is included in the cognitive and mental structures of preservice teachers. Although this result shows similarity with the trend emerging on the multidimensionality of the concept of agriculture in the studies carried out by Akyüz (2013), OECD (2001) and Moon (2012), it can be concluded that preservice teachers have insufficient awareness concerning the

strategic importance of agricultural sector in the fields of marketing- distribution network and economy. At the present time in which food allergy increased by 18% (Misirlioğlu-Dibek & Bostancı, 2013) in the longitudinal studies carried out especially by International Health Centers, the fact that no description is encountered concerning preservice teachers nutrition and food allergies images among a total of 184 images of the field of food is thought provoking and worrying situation. Indeed, this situation shows similarity with the results obtained in the study carried out by Ercan et al. (2012).

According to research results, it was emphasized that teachers' knowledge level on food allergy is insufficient in Turkey and that training should be organized about what can be done in situations that may occur in emergency situations in students. Agriculture Literacy and Awareness which has an increasing popularity in the international literature (Anderson, 2011; Eason, 2014; Balschweid, Thompson & Cole, 1998; Frick, Kahler & Miller, 1991; Knoblock, Ball & Allen, 2007; Powel and Agnew, 2011; Trexler & Suvedi, 1998) and in which multidimensionality of agriculture concept is discussed is seen as the field that needs to be addressed at all levels of education starting from pre-school. It has been seen that agriculture and agricultural literacy issues have been examined in limited number of studies in Turkey (Akgül, 2011; Haşiloğlu, 2009; Somuncu & Bahar, 2011; Somuncu-Demir & Bahar, 2014; Somuncu-Demir & Bahar, 2015), and that an attempt to integrate them into education has been made. Based on these results, it is suggested to carry out training enriched by multifunctional agriculture issues to be held in the faculties of education concerning the deficiencies, misconceptions and insufficient awareness levels revealed in preservice teachers, and applied and longitudinal studies that will improve preservice teachers' level of competence.

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Figure 3: Examples of preservice teachers' images



Figure 4: Examples of preservice teachers' images

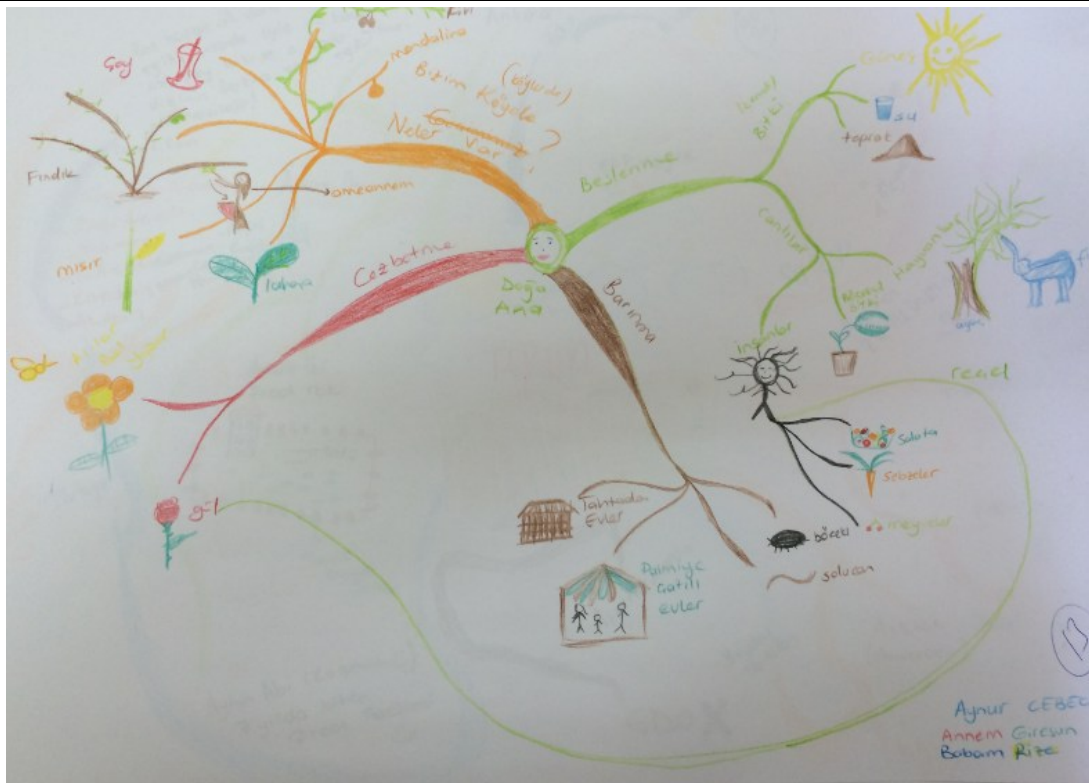


Figure 5: Examples of preservice teachers' images

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