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Evaluation of Urban Agriculture Training Courses Using Kirkpatrick's Model

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Abstract

The aim of the present study was to evaluate urban agricultural education effectiveness based on the Kirkpatrick model in Tehran, Iran. The study participants of this research were included all citizens participated in educational and counselling centers focused on flowers and plants in district two of Tehran municipality during 2016. The study participants consisted of 160 individuals, including 80 in the case group and 80 in the control group. The case group participated in urban agriculture training courses and the control group did not receive any training courses. The result showed a significant difference between the knowledge status of citizens before and after attending educational courses (p<0.01). Also, more than 86% of the citizens perceived the courses' effectiveness at moderate to high levels. In addition, there was a significant difference between the case and control groups in terms of reaction and behavior levels (p<0.01). The present study found that the urban agriculture training courses for citizens exhibited considerable effectiveness in the measurement results of the three levels of the Kirkpatrick model and that overall, the course had received positive evaluations. Therefore, these training courses can be recommended to enhance the knowledge of citizens about urban agriculture.

Keywords:
Citizenship education; Kirkpatrick model; Tehran; urban agriculture

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INTRODUCTION

One of the most important consequences of economic development and industrialization of the countries is the rapid expansion of the cities and urban populations (Drakakis-Smith, 2017). Nowadays, the world's urban population has crossed 50%, and this growing urbanization trend is irreversible and cannot be ignored (Desa, 2014). Food security is one of the main challenges due to increasing the urban population (Poulsen, et al., 2015). Thus, new kinds of local agriculture have been emerged in the form of urban agriculture and considered by policymakers and urban residents due to their huge potential benefits for urban areas (Lin et al., 2015). Urban agriculture is beneficial for different social development such as urban food security (to prevent hunger and provide access to fresh and healthy food), community development (to increase social cohesion and crime prevention) and for educational purposes (Van Tuijl, Hospers, & Van Den Berg, 2018). The concept of urban agriculture has been widely discussed in different disciplines including urban planning, food security strategies, legal scientists deal with issues like food justice, economists focus on themes like innovation and new business models, and engineers explore new farming technologies (Morgan, 2009; Opitz, Specht, Berges, Siebert, & Piorr, 2016; Turner, Henryks, & Pearson, 2011; Whittinghill & Rowe, 2012). McClintock (2010) theorized the concept of urban agriculture to explain the rising interest of urban agriculture. Guitart et al. (2012) provide a detailed overview of the literature on urban community gardens, however Tornaghi (2014) reviews urban agriculture in the interdisciplinary literature to build a research agenda for the field of human geography. Training courses can increase the citizen's knowledge on urban agriculture which improve food security and urban environmental management (Pourjavid et al., 2020). Urban agriculture could be called as the production of edible and non-edible plants and livestock products within and around the cities (Carletto et al., 2015; FAO, 2015). Protecting genetic diversity among the plants and developing urban agriculture are the common ways toward global food security and sustainable development (Dejahang, Mahna, Akhtar, & Mousavi, 2018; Farajpour, Ebrahimi, Baghizadeh, & Aalifar, 2017; Hassanabadi, Ebrahimi, Farajpoura, & Dejahang, 2019). FAO (2010) reported that about 15% of global food produced by 800 million people in urban areas. The UN has introduced urban agriculture as a strategy to reduce urban food insecurity and to build cities with more flexibility for encountering unexpected crisis. Mkwambisi et al. (2011) showed that accepting urban agriculture without training courses result in a lower performance than its potential. It seems that citizen education can play a vital role in urban agriculture formation. Citizenship agriculture education creates a new and targeted relationship between citizens and the environment and nature. The practical result of training is appeared in the concept of effectiveness and can be calculated through the evaluation process (Bowen, 2018). Educational assessment is presumed as one of the most crucial programs of each institution that provides suitable and required information in order to design and review of any system (Mawer, 2014). Educational effectiveness assessment in the area of urban agriculture focuses on the impact of training on the development of skills required for urban agriculture. Kirkpatrick model is a simple and practical pattern for evaluating educational programs and described as a comprehensive, straightforward, and realistic model for many educational situations (Kirkpatrick & Kirkpatrick, 2016). The Kirkpatrick model consists of four levels including reaction, learning, behavior, and results, and thus its full name is the Kirkpatrick four-level evaluation model. Baker (2013) examined the components of the agricultural education program in New Mexico and compared four components including tools and equipment, content, educational activities, and expected

accomplishments. The results illustrated that water ownership, environmental protection, green space management, and urban production management were pointed out as major contents of the agricultural education programs in New Mexico. Additionally, holding exhibitions and workshops were considered as one of the worthwhile educational activities in these programs.

Harms et al. (2013) evaluated the needs of urban gardeners and farmers throughout the United States with respect to soil contamination. The results uncovered that the majority of respondents had no knowledge and ability to manage soil contamination. The authors concluded that collaboration among soil scientists and agricultural and natural resources, horticultural, and family sciences extension personnel must be sought in the preparation and dissemination of future extension materials and programming. Haller et al. (2013) examined the attitudes of citizens towards food production at three small, medium and, large scales in the city of Lausanne, Switzerland. They reported that when citizens have the prospect of growing vegetables on them, they appreciate the presence of production sites even more. Urban agriculture projects are expected to have broader popular support and a stronger impact on urban quality when the population actively participates in urban food production.

Obour et al. (2015) studied vegetable grower's knowledge about the use of fertilizer in the city of Sunyani, Ghana. Limited knowledge of farmers about the use of fertilizer and its management, and the high price of chemical fertilizers has restricted the use of this input. The author reported that to improve sustainable use of fertilizers for peri-urban vegetable production, intensifying education on fertilizer use and management through agricultural extension services, the media, and at the point of sales are necessary. Respecting mentioned cases and educational activities carried out by Tehran municipality in the field of urban agriculture, this research planned to examine and evaluate the role of educational courses based on the framework of Kirkpatrick's effectiveness evaluation model. In the present study three levels of Kirkpatrick's model including reaction, learning, and citizenship behavior, were evaluated. Figure 1 presented the framework diagram of the present study based on the literature review and the Kirkpatrick model. Most of the mentioned studies have underlined the level of learning, while only a few have applied a broad approach incorporating higher levels of learning. Overall, the effectiveness of urban agricultural education remains unexplored when higher levels of the learning hierarchy are taken into account. Therefore, the present study aimed to evaluate the effectiveness of urban agricultural training program, using the Kirkpatrick model.

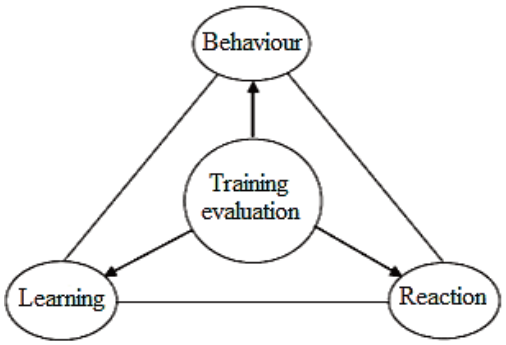

Figure 1. Framework Diagram of the Present Study.

METHODOLOGY

The practical training is one of the most important factors in the growth and development of societies (Wang, 2019). In order to follow this principle, the Tehran Parks and Green Spaces Organization, which belong to the Tehran municipality, has implemented urban agricultural education courses in different regions of Tehran. Therefore, this research was conducted to evaluate the effectiveness of these training courses. The present study was a case study that employed a one group pre-posttest design and conducted a literature review to plan and design an urban agriculture course. The study participants of this research were included all citizens participated in educational and counselling centers (80 individuals) focused on

flowers and plants in district two of Tehran municipality during 2016. The control group was consisted of 80 person from the same region with conditions similar to the case group in terms of economic, social and cultural status. The training courses was included "Gardening", "Public green space", "Vegetable planting" and "Aloe barbadensis". The District 2 of Tehran is ranked as the fifth and third district in terms of area (49.3 km2) and population (701,303), respectively, with 239,742 households (Tehran-Municipality, 2016). Based on the literature review and Kirkpatrick's effectiveness evaluation model a two-part questionnaire was prepared for data collection. The first part was about individual and professional characteristics, and the second part examined the role of citizenship education in the field of urban agriculture, which was designed to appraise the realization of educational goals after passing the courses. This part included three levels as follows: reaction, learning and behavior levels. The reaction level consisted of 17 questions, scored on a five-point Likert scale, with one representing "strongly disagree" and five representing "strongly agree". The learning level was aimed to assess the status of the knowledge and awareness of the citizens before and after participating in education courses. The learning and behavior levels consisted of 13 and 7 questions, respectively, and were scored from 0 to 10. According to Kirkpatrick's recommendation, a control group of equal size was used to evaluate the effectiveness of reaction and behavior levels. The qualitative levels of the reaction, learning and, behavior were measured according to Kirkpatrick's evaluation model presented in Table 1 (Kirkpatrick & Kirkpatrick, 2016). The validity of the questionnaires was approved by two faculty members of Department of Agricultural Extension and Education, Science and Research Branch, Islamic Azad University, Tehran, Iran and an expert from flowers and plants' educational and counselling center in District 2. The questionnaire employed the reliability coefficient Cronbach's alpha to determine the degree of internal consistency. The Cronbach's alpha coefficient was higher than 0.90 indicating an appropriate reliability of the research tool. The data were analyzed using the SPSS version 22 software. In order to compare the pre-posttest data derived from reaction and behavior levels, an independent t-test was used. Also to compare the results of before and after the learning courses, a paired t-test was applied.

RESULTS AND DISCUSSION

The results revealed that the average age of respondents who participated in the urban agriculture education courses was 47 years old, however, the majority of respondents had 41-50 years. A large number of the respondents were women (73.8%) and 73.7% of them were married. The results also showed that the education level of the main part of respondents (31.3%) was a diploma. The majority of respondents were householders (35) followed by government employees (16), Self-employed (15), retired (11), and unemployed (3). Furthermore, 72.5% of the respondents lived in apartment buildings and 70% had a personal house. The result demonstrated that 42.5% of participants had agricultural background. According to the Table 2, the three following question items including "satisfaction with reception and registration", "lecturer discipline in his/her educational activities such as timely attendance at the class and adhering with the class time", and "willingness to re-participate in such courses" were ranked from the first to the third places in terms of reaction level, respectively. However, the willingness to pay for the course was located at the last rank. The results of the frequency distribution of respondent's reaction indicated that the sum of means and standard deviation were 73.6 and 10.67, respectively (Table 3). Also, 55% of the respondents evaluated the reaction level at the good level. Comparison of the case and control groups in terms of reaction level revealed that the two groups had a significant difference (p<0.01, Table 3).

Table 1
The Quality Scoring of the Three Kirkpatrick's model levels

Quality level	Formula
Poor (A)	A ≤ Sum of Means - Standard deviation (Sd)
Average (B)	Sum of Means – Sd < B ≤ Sum of Means
Good (C)	Sum of Means < C ≤ Sum of Means + Sd
Excellent (D)	Sum of Means +Sd <D

Table 2
Reaction Level (Course Satisfaction) Scale, Based on Urban Agriculture Training Courses

Question Items	Mean	SD	Coefficient of variation	Rank
I was satisfied with reception and registration process	4.65	0.677	0.145	1
I was satisfied with instructors' discipline in educational activities such as timing.	4.6	0.668	0.145	2
I would like to participate in case these courses are held again.	4.58	0.759	0.165	3
I was satisfied with the performance of training center staff.	4.56	0.809	0.177	4
I was satisfied with instructors' teaching methods, and I believe that they had enough knowledge and experience.	4.53	0.297	0.204	5
Instructors listened to the questions and responded accurately.	4.51	0.811	0.179	6
I was satisfied with the course duration.	4.44	0.744	0.167	7.5
I and the others participated in the group discussions of the course.	4.44	0.824	0.185	7.5
I was satisfied with the course content.	4.38	1.048	0.239	9
The instructors used educational materials such as photographs, posters, and so on appropriately.	4.35	0.929	0.213	10.5
Specialists were hired as the instructors.	4.35	0.969	0.222	10.5
I and the other citizens were helped during the course.	4.31	0.976	0.226	12
I was satisfied with the course time.	4.23	1.006	0.237	13
I was satisfied with the notification system for time and place.	4.2	1.107	0.263	14
I could simply carry out the content that was being discussed.	4.19	0.858	0.204	15
I was satisfied with the educational equipment.	3.78	1.292	0.341	16
I am willing to pay for the course.	3.53	1.475	0.417	17

Table 3
Frequency Distribution of Reaction Level

Before the course					After the course			
Cumulative percentage	Percentage	Frequency (person)	Scale		Scale	Frequency (person)	Percentage	Cumulative percentage
8.75	8.75	7	(x<62.93)	Poor	(x<110.12)	0	0	0
35.00	26.25	21	(62.94<x<73.60)	Average	(110.13<x<120.21)	10	12.5	12.5
90.00	55.00	44	(73.61<x<84.27)	Good	(120.22<x<129.88)	25	31.25	43.75
100	10.00	8	(84.28<x)	Excellent	(129.89<x)	45	56.25	100
	100	80		Total		80	100	

Maximum: 85 Minimum: 27 Variance: 113.89 Standard deviation: 10.67 Mean: 73.60 Median: 76 Mode: 76

Maximum: 107 Minimum: 63 Variance: 102.23 Standard deviation: 9.45 Mean: 84.91 Median: 85 Mode: 85

According to the results, there was a significant difference between the case and control in terms of the reaction level. In other words, citizens responded positively to training courses in the field of urban agriculture. Hence, more than 91% of the citizens perceived the courses' effectiveness at a moderate to high levels (Table 3). This can be due to some satisfaction factors such as registration process, teacher discipline in educational activities, and appropriateness of the course duration. Similar results were reported by Mohammad Khani et al. (2013), Keramati Nejad et al. (2016), and Chao et al. (2018). The results of the learning level were presented in Table 4. The question items before the training courses were ranked based on the coefficient variation. According to the results the top three question items before the training courses were as follows: "recognition of the vegetables type", "recognition of the seasonal vegetables", and "recognition of edible parts of vegetables". However, "recognition of seasonal vegetables", "Identifying the suitable place to plant vegetables at home" and "recognition of the appropriate depth for vegetables planting" were the top three question items after the courses. The results of the frequency distribution of respondent's learning showed that the sum of means and standard deviation before the courses were 26.67 and 16.75, respectively (Table 5). In addition, the sum of means and standard deviation after the courses were 114.35 and 13.22, respectively. Also, the respondents evaluated the learning level before and after the courses at the average (35%) and good (42.4%) levels, respectively. In the

Table 4
Learning Level Scale, Based on before and after Urban Agriculture Training Courses

Before the courses				Question items	After the courses			
Mean	Standard deviation	Coefficient of variation	Rank		Rank	Coefficient of variation	Standard deviation	Mean
2.79	2.271	0.813	1	Recognition of the vegetables type	6	0.171	1.513	8.84
2.6	2.066	0.794	3	Recognition of the seasonal vegetables	1	0.148	1.354	9.13
2.6	2.041	0.785	2	Recognition of edible parts of vegetables	7	0.168	1.485	8.81
2.29	2.057	0.898	4	Identifying the suitable place to plant vegetables at home	2	0.149	1.34	8.95
2.08	1.947	0.936	5	Preparation of a suitable substrate for vegetables cultivation	5	0.155	1.379	8.85
2.01	1.984	0.978	6	Recognition of the types of cultivatable vegetables at home	4	0.169	1.499	8.86
1.91	1.78	0.931	7	Recognition of the various vegetables' seeds	11	0.167	1.458	8.73
1.87	1.814	0.97	8	Recognition of the best time for irrigation of vegetables	10	0.179	1.569	8.76
1.86	1.674	0.9	9	Recognition of the best time to plant vegetables at home	9	0.172	1.521	8.8
1.85	2.129	1.15	10	Vegetable fertilization method	12	0.182	1.586	8.7
1.83	2.115	1.155	11	The most suitable time to harvest vegetables	8	0.176	1.552	8.81
1.8	1.679	0.932	12	Recognition of the appropriate depth for vegetables planting	3	0.148	1.316	8.88
1.19	1.519	1.276	13	Preparation method of non-chemical pesticide for vegetables	13	0.266	2.195	8.24

Table 5

Frequency Distribution of Learning Level

Before the courses					After the courses			
Cumulative percentage	Percentage	Frequency (person)	Scale		Scale	Frequency (person)	Percentage	Cumulative percentage
16.25	16.25	13	(9.92>x)	Poor	(101.13>x)	15	18.75	18.75
51.25	35.00	28	(26.67>x>9.93)	Average	(114.35>x>101.14	19	23.75	42.5
85.00	33.75	27	(43.42>x>26.68)	Good	(127.57>x>114.36)	34	42.50	85.00
100	15.00	12	(x>43.43)	Excellent	(x>127.58)	12	15.00	100
	100	80		Total		80	100	
Maximum: 63 Minimum: 0 Variation: 280.57 Standard deviation: 16.75 Mean: 26.67 Median: 26 Mode: 0					Maximum: 130 Minimum: 66 Variation: 174.78 Standard deviation: 13.22 Mean: 114.35 Median: 117 Mode: 117			

dimension of learning characteristics, the result indicated a significant difference between the knowledge status of citizens before and after attending educational courses. The status of participants' knowledge after participation in the courses has been increasingly improved, which can be basically attributed to the outcomes of training programs (Harms et al., 2013; Obour et al., 2015). In explaining the effect of citizenship education in the field of urban agriculture on learning characteristics, it can be said that there is always an inextricable relationship between training and learning (Antonacopoulou, 2001). Hence, as long as inadequate training is provided, no improvement can be expected (Modiba, 2018). Based on the results, the mean value of the participants' knowledge after the training courses was more than before the courses, indicating the effectiveness of training courses on the participants' knowledge. In order to compare pre-posttests, a paired t-test was applied. The result showed a significant difference between the knowledge status of citizens before and after attending educational courses (p<0.001). According to the Table 6, the three following question items including "observing planting depth", "using proper soil" and "keeping the pot or cultivation box in a proper place at home" were ranked from the first to the third places in terms of behavior level, respectively. The results of the frequency distribution of the respondent's behavior revealed that the sum of means and standard deviation were 59.8 and 8.24, respectively (Table 7). Also, 42.5% of the respondents assessed the behavior level at the good level. Also, there was a significant difference between the case and control groups in terms of behavior level (p<0.001). The results of this study showed that the citizens' perspective on the level of their learning was positive and effective. It can be concluded that the sources of learning in these courses were beneficial and relevant. Proper behavior is one of the main learning outcomes (Beinicke & Bipp, 2018). The results of the urban agriculture training courses showed a positive and useful effect on the citizens' behavior. More than 76% of the citizens evaluated the impact of courses on the behavior level at a moderate to high levels. It seems that the participants used these provided urban agriculture training courses in their urban agricultural tasks. To evaluate the questionnaire, 20 questionnaires were completed in the similar statistical population, and the Cronbach's alpha coefficient was calculated for all three levels (Table 8). The Cronbach's alpha coefficients were higher than 0.90 indicating an appropriate reliability of the research tool. The results of paired t-test for means before and after the courses confirmed the effectiveness of the model, which were statistically significant for the

Table 6
Behavior Level Scale, Based on Urban Agriculture Training Courses

Items	Mean	SD	Coefficient of variation	Rank
Observing planting depth	8.9	1.318	0.145	1
Using proper soil	8.66	1.484	0.171	2
Keeping the pot or cultivation box in a proper place at home	8.63	1.878	0.217	3
Timely irrigation	8.59	1.689	0.196	4
Using biological and non-chemical fertilizers	8.4	1.658	0.197	5
Using proper seed	8.4	1.985	0.236	6
Non-chemical control of pests and disease	8.23	2.031	0.246	7

Table 7
Frequency Distribution of Behavior Level.

Before the course					After the course			
Cumulative percentage	Percentage	Frequency (person)	Scale		Scale	Frequency (person)	Percentage	Cumulative percentage
23.75	23.75	19	(51.56>x)	Poor	(x<103.19)	13	16.25	16.25
37.50	13.75	11	(59.80>x>51.57)	Average	(103.20<x<120.45)	29	36.00	52.25
80.00	42.5	34	(68.04>x>59.84)	Good	(120.6<x<131.65)	11	14.00	66.25
100	20.00	16	(x>68.04)	Excellent	(131.66<x)	27	33.75	100
	100	80		Total		80	100	
Maximum: 85 Minimum: 27 Variance: 113.89 Standard deviation: 10.67 Mean: 73.60 Median: 76 Mode: 76					Maximum: 107 Minimum: 63 Variance: 102.23 Standard deviation: 9.45 Mean: 84.91 Median: 85 Mode: 85			

Table 8
The Cronbach's Alpha Coefficient of Different Levels

Different questionnaire parts	Items No.	Cronbach's alpha
Respondents' reaction to urban agriculture training courses	17	0.98
Respondents' learning in the field of urban agriculture	56	0.91
Respondents' behavior in the field of urban agriculture	28	0.96

Table 9
Paired t Test of Three Levels of Kirkpatrick Model Before and After the Courses.

	Mean			
Level	Before	After	t-value	*p*-value
Reaction	73.60	84.91	61.47	0.000
Learning	26.67	114.35	52.79	0.000
Behaviour	59.80	73.12	57.38	0.000

levels ($p < 0.01$; Table 9). Based on the findings, the present study found that the urban agriculture training courses for citizens exhibited considerable effectiveness in the measurement results of the three levels of the Kirkpatrick Model (reaction, learning and behavior) and that overall, the course had received positive evaluations. Therefore, these training courses can be recommended to enhance the knowledge of citizens about urban agriculture.

CONCLUSION

Urban agricultural is thought to have a positive effect on sustainable urban development in environmental, economic and social areas. Although most of the effects attributed to urban agriculture are positive, there are also critical aspects and concerns. The effectiveness of urban agricultural education remains unexplored when higher levels of the learning hierarchy are taken into account. The results of the present study showed a significant difference between the knowledge status of citizens before and after attending educational courses. Also, more than 76% of citizens perceived the courses' effectiveness at moderate to high levels. According to the results, the urban agriculture training courses for citizens exhibited considerable effectiveness in the measurement results of the three levels of the Kirkpatrick Model (reaction, learning and behavior). Therefore, these training courses can be recommended to enhance the knowledge of citizens about urban agriculture. Also, it can be considered as a kind of investment in urban planning by policymakers and program planners.

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