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## Impact of a service learning (SL) experience on the improvement of knowledge in healthy eating habits in teenagers

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### Abstract

In this article, we evaluate the results of a service learning (SL) experience, conducted by students of the 4th course of Human Nutrition and Dietetics (ND) degree, trained as health promoting agents (HPA), from the Universitat Rovira i Virgili (URV) applied in a sample of high school teenagers from Reus. The aim of the SL experience was to know of healthy eating habits with special attention to the structure of meals and the health effects of alcohol. We evaluated 533 teenagers, female 52.7%, aged 11 to 15, from 5 different public and charter high schools of Reus in 2015-16 academic year. It consisted in a 1h-activity designed and performed by ND students and developed in the teenager high school classroom using audio-visual support. ND students evaluated the changes in healthy knowledge before and after the only activity by a questionnaire score (100 points). The final assessment of the teenagers was improved 4.85 points respect to the initial and seems to be more effective in younger teenagers, Girls get a better initial evaluation score than boys, but both improved their knowledge after the activity. Public high school teenagers have lower initial and final knowledge about nutrition than charter school teenagers. In conclusion, an only 1-hour SL experience implemented in high school and developed by university HPA is an easy tool to improve healthy nutritional knowledge in teenagers.

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### 1. Introduction

Service learning (SL) is an educational experience that combines the process of learning and the community service to amend a social problem, articulated in a single project in which participants are trained to work on the real needs of the environment with the aim of improving it.

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This type of learning is a teaching experience and reflection with collaboration of partnerships as institutions and organizations which providing support to SL. The SL produce personal development, institutional changes and improvements to the environment, by formal education and non-formal education used (Puig, Batlle, Bosch & Palos, 2006).

The SL experience in a university context can instil a sense of civic duty in students, make them aware of the inherent value of their contribution to the community, and enrich their classroom-learning experience. Students complete their SL experience with an understanding of the importance of providing a SL and how it enriches their lives, and probably SL training will prepare ND students face success in future professional careers (Heiss, Goldberg, Weddig & Brady, 2012). The Universitat Rovira i Virgili (URV) has institutionalized the SL educational approach and included its characteristics in the Framework Document For The Service-Learning Program (Approved by the University Senate on 23 February 2012).

In ND education, SL engagement in the community can systematically expose students to important public health issue. This training prepare students for the professional world as the nutritionist performs support tasks on food, nutrition and health, make diets properly prepared focused on the general or sick population, according to the principles of human nutrition, and also recommend, advice, inform and educate people in the matter of food and human nutrition. To promote health, ND degree students were trained to become "health promoting agents" (HPA).

Promoting a healthy lifestyle and nutrition is important at all stages of life. However, an important target group is teenagers of high school age, especially when they are old enough to understand what you want to transmit and are sufficient young to be influenced. Nutrition education at high school is an efficient way to reach a large segment of the population, which includes not only young people but also their teachers, their families and the community to which they belong. In European adolescents (including Spanish adolescents) there is an increase in unhealthy dietary habits and a decrease in breakfast consumption before leaving home, which can lead to obesity (Currie, Zanotti, Morgan, Currie, de Looze & Roberts, 2012).

In fact, the URV is involved in several initiative that have been remarkably successful to promote nutritional health in schools in Educació en Alimentació (EdAl) study (Llauradó, Tarro, Moríña, Queral, Giralt & Solà, 2014; Tarro, Llauradó, Moríña, Solà & Giralt, 2014a, Tarro, Llauradó, Albaladejo, Moríña, Arijá, Solà & Giralt 2014b) and in high schools in European Youth Tackling Obesity (EYTO) project (Llauradó, Aceves-Martins, Tarro, Papell-Garcia, Puiggròs, Arola, Prades-Tena, Montagut, Moragas-Fernández, Solà & Giralt, 2015).

From all mentioned comments, the aim of our SL experience was to evaluate the effectiveness of one activity of one hour on healthy eating habits with special attention to the structure of meals and the health effects of alcohol, conducted by university students of the 4th course of Human ND degree from the URV in a sample of local teenagers of high school.

## **2. Material and methods**

To carry out this SL experience, 6 university students of ND degree were trained to become HPA, and created a one-hour activity on the basis of which is a healthy diet, and what it should contain. The target population were teenagers, for this reason, "the influence of alcohol" were added to the objectives of the activity. This SL experience was carried out in 5 high schools in Reus (41 ° 9 '17 "N, 1 ° 6 '31" E): Vila-seca, Domènech i Montaner, Gaudí, Josep Tapiró which were public schools and Puigcerver, which was charter.

For 7 days, the university students, from now HPA, designed and simulated the one-hour activity. This work was supervised by university professors and the programming of those days is detailed in Fig. 1. The background, the content, the methodology, the resources and evaluation of the activity was designed by HPA based on recent literature. The programming unit was supervised and finally approved by professors. The activity evaluation results and reflection on the SL experience was evaluated by professors at the end of the experience.

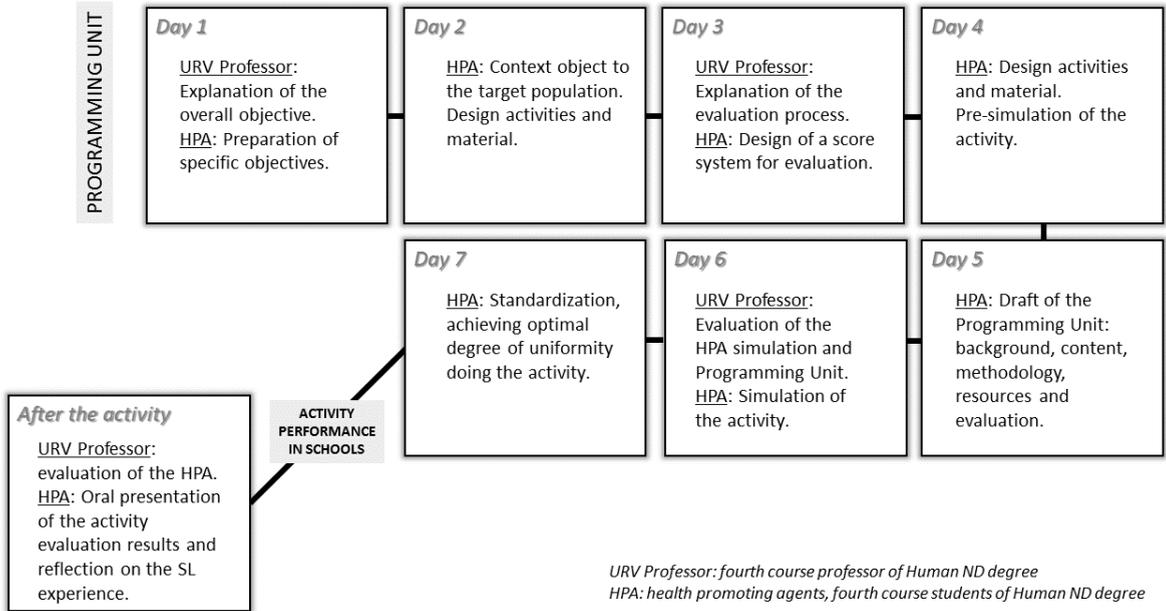


Fig. 1. 7-days program for the design, simulation and standardization of the activity.

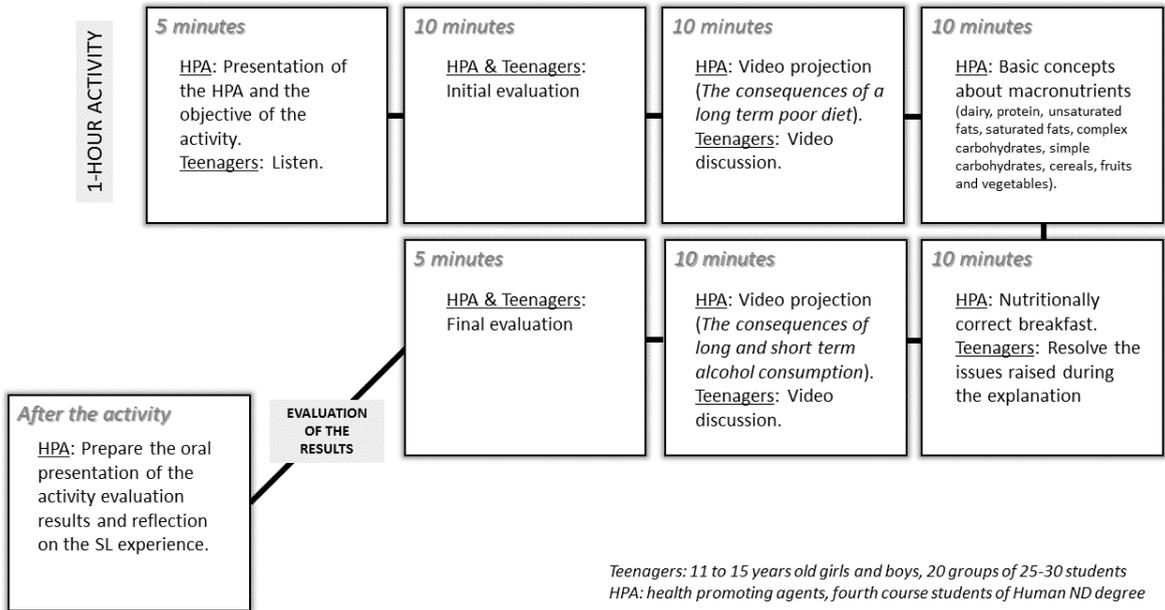


Fig. 2. One-hour activity design.

The one-hour activity consisted of seven parts performed in the teenager high school classroom and it is detailed in Fig. 2. HPA did activities in 5 schools and 20 classrooms (20 one-hour activities, each classroom had approximately 25 to 30 teenagers). Audio-visual support was used to improve the attention of teenagers and clarify the explanations. An evaluation system was designed to detect the changes before and after the activity of teenagers. It consisted of seven questions: 1) the number of meals per day, 2) daily consumption amount of dairy, 3) what should contain a healthy breakfast, 4) which foods contain more calories and which less, 5) what food groups should contain a meal, 6) recommended intake of processed meat and finally 7) recommended amount of alcohol consumption. The options for the questions were screened with illustrative photographs to teenagers and they must answer in a given time. Each question was evaluated (100 points maximum) and a mean total initial and final score was calculated (100 points maximum).

A statistical analysis was performed to obtain initial and final scores and to compare them between sex, ages and schools (SPSS). The descriptive results were expressed as the mean and standard deviation of scores. Mean comparisons were made by ANOVA and paired t-test. The level of statistical significance for all tests was  $p < 0.05$ .

### 3. Results

Table 1 summarizes the percentage of high school teenagers (total  $n=533$ ) in each group (gender, high school and course) and its age.

Table 1. Baseline characteristics of high schools ( $n=533$ )

		Frequency	Age (years)	
		n%	Mean	SD
Gender	Boys	47.3	12.6	1.1
	Girls	52.7	12.5	0.9
High School	Vila-seca	35.3	13.1	1.3
	Domènech	16.3	11.8	0.4
	Gaudi	19.1	12.1	0.5
	Tapiró	16.1	12.1	0.5
	Puigcerver	13.1	12.9	0.4
Course	1st	72.2	12.1	0.5
	2nd	13.1	12.9	0.4
	3rd	14.6	14.4	0.8

Table 2 details the initial and final score of all teenaged participants. The maximum punctuation of each evaluation question and the total score was 100 points.

Table 2. Comparison between initial and final evaluation of the one-hour activity evaluation quiz ( $n=533$ )

	Initial score		Final score		p-value
	Mean	SD	Mean	SD	
Evaluation Quiz (100 point max. each question)					
1- Number of meals per day	39	49	98	13	<0.001
2- Daily consumption of dairy	80	40	98	15	<0.001
3- What should contain a healthy breakfast	70	46	68	47	0.506
4- Which foods contain more calories and which less	51	50	47	50	0.150
5- What food groups should contain a meal	86	35	40	49	<0.001
6- Recommended intake of processed meat	90	30	84	36	0.008

7- Recommended alcohol consumption	67	47	82	38	<0.001
Total Score (100 points max.)	68.99	19.56	73.84	18.88	<0.001

Table 3 summarises the measured initial and final total score by gender. In general, both groups have similar results to the whole group. However, the boys do not improve their knowledge in “Recommended intake of processed meat” ( $p=0.239$ ) as do girls ( $p=0.007$ ) and the whole group. In addition, the girls had higher initial scores of knowledge than boys ( $p<0.05$ ) in “Daily consumption of dairy”, “What food groups should contain a meal”, “Recommended intake of processed meat”, “Recommended alcohol consumption” and Total Score. Only the “Number of meals per day” and “Daily consumption of dairy” were higher in girls in the final score (data not shown).

Table 3. Comparison between initial and final evaluation score in boys and girls

	Initial score		Final score		p-value
	Mean	SD	Mean	SD	
BOYS (n=252) Total Score	65.14	20.68	72.05	19.89	<0.001
GIRLS (n=281) Total Score	72.45	17.84	a 75.44	17.80	0.023

a:  $P<0.05$  respect to boys

Table 4 shows the analysis of initial and final total scores of 1st, 2nd and 3rd course. The total score only differs between initial and final evaluation in the adolescents of the 1st course. Moreover, the question “Recommended intake of processed meat” and “Recommended alcohol consumption” did not have differences between the initial and final evaluation in the 2nd and 3rd course respectively. As it happened in the total group, there aren't differences between the initial and final evaluation of the questions “What should contain a healthy breakfast” and “Which foods contain more calories and which less” in any case (data not shown).

Table 4. Comparison between initial and final score in first, second and third course

	Initial score		Final score		p-value
	Mean	SD	Mean	SD	
1st COURSE (n=385) Total Score	66.83	19.70	72.28	18.23	<0.001
2nd COURSE (n=70) Total Score	77.35	19.98	a 82.04	16.80	a 0.092
3rd COURSE (n=78) Total Score	72.16	15.93	a,b 74.18	21.85	b 0.190

a:  $P<0,05$  respect to FIRST COURSE; b:  $P<0,05$  respect to SECOND COURSE

Table 5 summarizes the results of initial and final total score in five high schools of Reus. The difference between the initial and final score, which indicates the degree of improvement of knowledge were, in order of importance as follows: 7.8 points (Vila-seca) > 5.6 points (Gaudí) > 4.7 points (Puigcerver) > 3.3 points (Josep Tapiró) > -0.7 points (Domènech i Montaner). Moreover, Puigcerver group has the best initial and final score.

Table 5. Comparison between initial and final score in five high schools

	Initial total score		Final total score		p
	Mean	SD	Mean	SD	
Vila-seca (n=188)	68.84	18.86	76.60	19.75	<0.001
Domènech i Montaner (n=87)	72.25	17.61	71.59	15.63	a 0.781
Gaudí (n=102)	65.27	19.75	b 70.87	17.52	a 0.009
Josep Tapiró (n=86)	63.62	19.92	a,b 66.94	19.87	a 0.229
Puigcerver (n=70)	77.35	19.98	a,b,c,d 82.04	16.79	b,c,d 0.064

a:  $P<0,05$  respect to Vila-seca; b:  $P<0,05$  respect to Domènech i Montaner; c:  $P<0.05$  respect to Gaudí; d:  $P<0.05$  respect to Josep Tapiró.

Finally, the activity design and performance, and the reflection on the SL experience was presented orally by HPA (fourth course students of ND degree), and it was evaluated by professors at the end of the experience. The mean punctuation of the 6 HPA was  $8.7 \pm 0.4$  (maximum 10 points).

#### 4. Discussion

As expected, the present SL experience implemented by HPA has been effective on the improvement of knowledge in healthy eating habits in teenagers of high schools (Rosenkranz, 2012). The final assessment of the teenagers was increased 4.85 points respect to the initial assessment. Therefore, there is a significant improvement of knowledge of teenagers after the activity. If we look at the specific questions, teenagers improve their knowledge in the "Number of meals per day," the "Daily Consumption of dairy" and "Recommended Alcohol Consumption." Surprisingly, the number of correct answers about the question "What Should Contain a meal food groups" decreases after the activity. Although the final scores are higher than the initial in general only two high schools improved significantly their knowledge after the SL experience (Vila-seca and Gaudí), whereas others showed a tendency to improve its score after the intervention.

About a half of teenagers surveyed were boys and a half girls, they were distributed among five different schools, 20 classrooms and most of them were in their first year. Girls get a better initial score than boys, but both improved their knowledge after the SL experience. In fact, it has been reported that there are sex differences in general knowledge and that, with regard to nutrition, females get better scores than males (Lynn & Irwing, 2002). Initially, all public schools have lower initial punctuation than charter school, and almost all (75%) have lower final punctuation than charter school. The possible causal relations between socioeconomic status and nutrition knowledge has been well established in the literature (Darmon & Drewnowski, 2008) however, the curricula of teenagers could be deeper in nutrition in some schools than others. Finally, the SL experience seems to be more effective in younger teenagers. The improvement of knowledge on each quiz question is discussed below.

Number of meals per day: SL experience has increased awareness of the correct number of meals per day, considerer 5 per day. The low initial information on the subject may be due to a lack of knowledge about healthy eating habits. Moreover, television is the main source of information about nutrition for teenagers. Therefore, these sources of information are often not correct and the messages are not appropriate (Milosavljević, Mandić & Banjari 2015)

Daily consumption of dairy: Teenagers had a good level of information about dairy consumption before SL experience. In our environment, 56.5 % of adolescents have an adequate intake of dairy products, considerer 2 a day (Lima-Serrano, Guerra-MartínD & Lima-Rodríguez 2015). However, the questionnaire does not differentiate dairy from some dairy rich in fat, or low fat or yogurt so we could not know what are the foods that teenagers consider as milk.

What should contain a healthy breakfast: The majority, 70% of our teenagers, know that a healthy breakfast should contain: fruit, cereals, protein, fat and dairy. Although, according to Rufino et al. (2015), teenagers don't consumed all those foods in daily breakfast.

Which foods contain more calories and which less: At this point we find one of the limitations of the study, because HPA did not explain clearly enough this concept and that the final quiz question was formulated incorrectly and it could be misinterpreted, especially when comparing the caloric content of different food and drink.

What food groups should contain a meal: Here we find another limitation, since there was a decrease comparing the initial and final evaluation result. On the final quiz, the differences between the possible solutions were too subtle, which might generate false wrong responses.

Recommended intake of processed meat: In October 2015, WHO had published the results of carcinogenic effect of red and processed meat (WHO 2015).The media impact of this study was important. Thus, the majority of students affirmed that the consumption of this meat is harmful, instead of understanding that should be eaten in moderate daily amount or occasionally.

Recommended alcohol consumption: After the SL experience, teenagers aged between 12 and 14 years understand that low alcohol consumption is not bad. Surely this is because, in our country, drink wine or beer every day is a

habitual habit and not considered something detrimental to health (Scholz ,Navarrete-Muñoz, Garcia de la Hera , Gimenez-Monzo, Gonzalez-Palacios, Valera-Gran, Torres-Collado & Vioque, 2015). In the other hand, older students aged 14 to 16 already know before the SL experience that alcohol is harmful in small amounts as much as larger intakes for a short period of time. After the SL, the majority of participants realize that alcohol consumption is unhealthy whether in small or large quantities, which can derive many health problems, both short and long term.

Once finalized the activities in all high schools, the university professors evaluate the HPA (ND students). The evaluation results (8.7 out of 10 points) indicate the almost excellent development of the activities by university students.

In conclusion, an only 1-hour SL experience implemented in high school and developed by university HPA is an easy tool to improve healthy nutritional knowledge in teenagers.

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