Teaching plan guided by active methodologies of applied teaching in courses of good handling practices in food services

Plano de ensino orientado por metodologias ativas de ensino aplicado em cursos de boas práticas de manipulação para serviços de alimentação

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ABSTRACT

Introduction: Didactic methods and resources for teaching influence the learning process. **Objective:** To elaborate and apply a Teaching Plan in Good Handling Practices (GHP) courses intended for food services, adopting active methodologies in its pedagogical project. **Method:** Experimental design was "before-and-after", using theoretical knowledge and behaviors adopted in GHP as learning indicators. A questionnaire was applied (with ten questions) to assess theoretical knowledge, and to assess students' behaviors, a problem-situation was simulated, where a food handler performed procedures, and each participant should identify what was right and what was wrong (14 behaviors). **Results:** Applied in courses provided by Senac/RS, the sample encompassed 5 classes, totaling 114 students, with the following schooling degrees: Elementary School (n = 22 – 19.3%), High School (n = 53 – 46.5%), and Higher Education (n = 39 – 34.2%). There was a statistically significant increase in theoretical knowledge acquired, with average correct answers of 7.13 before and 8.94 after the course. Median was 8, with lower quadrant (Qu.in) 6 and upper quadrant (Qu.su) 8 before, and median 9, with Qu.in 8 and Qu.su 10 after the course. Similarly significant was the increase in recognition and adoption of adequate behaviors in GHP with mean values of 4.36 before and 7.56 after the course. The median of behaviors was 5, with Qu.in 2 and Qu.su 7 before, and 8, with Qu.in 7 and Qu.su 11 after the course. **Conclusions:** There was an increase in the number of correct answers after the course at every education level; however, the higher the education level, the higher the number of correct answers in the questionnaire and of behaviors correctly identified in the problem situation.

KEYWORDS: Good Handling Practices of Food; GHP; Active Methodologies

RESUMO

Introdução: Os métodos e os recursos didáticos de ensino influenciam no processo de aprendizagem. **Objetivo:** Elaborar e aplicar um plano de ensino em cursos de Boas Práticas de Manipulação (BPM) destinados aos serviços de alimentação, adotando em seu projeto pedagógico metodologias ativas. **Método:** O delineamento experimental foi do tipo "antes- depois", utilizando como indicadores de aprendizagem o conhecimento teórico e as atitudes adotadas em BPM. Para avaliar o conhecimento teórico, foi aplicado um questionário (dez questões) e, para avaliar as atitudes dos alunos, foi simulada uma situação-problema na qual uma manipuladora de alimentos executava procedimentos e cada participante deveria identificar o que estava certo ou errado (14 atitudes). **Resultados:** Aplicada em cursos realizados pelo Senac/RS, a amostra contou com cinco turmas totalizando 114 alunos, com graus de escolaridade fundamental (n = 22 – 19,3%), médio (n = 53 – 46,5%) e superior (n = 39 – 34,2%). Verificou-se um aumento estatisticamente significativo na aquisição de conhecimentos teóricos com acerto médio

de 7,13 nas questões antes do curso e de 8,94 depois. A mediana foi 8 com quadrantes inferior (Qu.in) 6 e superior (Qu.su) 8 antes, e mediana 9 com Qu.in 8 e Qu.su 10 depois do curso. Igualmente significativo foi o aumento no reconhecimento e na adoção de atitudes adequadas em BPM com média de 4,36 antes, e de 7,56 depois do curso. A mediana das atitudes foi 5 com Qu.in 2 e Qu.su 7 antes, e 8 com Qu.in 7 e Qu.su 11 depois do curso. **Conclusões:** Em todos os graus de escolaridade ocorreu aumento do número de acertos depois do curso, mas quanto maior o grau maior o número de acertos no questionário e nas atitudes corretamente identificadas na situação-problema.

PALAVRAS-CHAVE: Boas Práticas de Manipulação de Alimentos; BPM; Metodologias Ativas

INTRODUCTION

In Brazil, with the change in people's lifestyles due to urbanization and changes in the job market, there has been an increase in the consumption of food outside the home[1]. For example, in a study[2] using data from the Family Budget Survey (POF/Brazilian Institute of Geography and Statistics) in 2008-2009, it was observed that the consumption of food outside the home by individuals over the age of 10 was reported by 41.2% of respondents. The 2017-2018 POF confirms that the trend towards eating away from home has become an option for more and more people. Of the total expenditure of Brazilian families on food, almost a third (32.8%) was dedicated to meals away from home[3]. This demand for ready meals has led to an increase in the number of establishments in the food sector, with a growth in the number of restaurants, snack bars, convenience stores, fast food chains, and bakeries, among others.

The constant search for food away from home can be a risk factor for increased health problems due to microbiological contamination of food and, consequently, food-borne illnesses[4]. To deal with this risk, at all three levels of government (federal, state, and municipal), Health Surveillance has formulated and implemented actions to increase food safety and reduce the risk of illness. The regulatory framework for these actions is the Resolution of the Collegiate Board (RDC) No. 216, of September 15, 2004, of the Brazilian National Health Surveillance Agency (Anvisa), which provides for the Technical Regulation of Good Practices for Food Services[5]. The regulation establishes that, among other procedures required for the operation of an establishment where food is handled, the person responsible for handling the food must have undergone a proven training course in food handling.

Based on this requirement, several municipalities[6] have drawn up regulatory frameworks stating that, in order to obtain or renew a health permit, it is mandatory for owners and managers of establishments that handle, produce, fractionate, store, distribute, and commercialize food to take part in Training Courses in Good Practices for Food Services. These regulations are in line with scientific evidence obtained[7] that training food service operators is a necessary or indispensable requirement for guaranteeing a product that is harmless to human health.

However, in order to guarantee the health benefits of mandatory education in good handling practices (GHP), the teaching processes and didactic strategies adopted in the courses need to be based on theoretical-pedagogical models that facilitate learning.

For example, the so-called traditional teaching model is widely used in Brazil. In this pedagogical process, teaching is centered on the teacher, because the emphasis is on the transmission of certain content. Classes are taught in a predominantly expository manner, almost like a lecture, while the student is merely a receiver of information. In this teaching paradigm, the way of checking whether the student has learned the content is measured in tests, predominantly based on memorization, the aim of which is to verify the quantity and depth of the information acquired. Thus, in this pedagogical model, the assumption is that if the students satisfactorily complete the questions asked in the tests, they have assimilated the knowledge and can therefore move on to the transmission of new content[8,9,10,11,12].

Various criticisms have been leveled at the limits of the effectiveness of the traditional pedagogical model, which can be identified in various circumstances in training courses for food handlers. These include the fact that in this paradigm students are not considered in their individuality. They are all treated in the same way, regardless of their level of education, their learning limits or potential, their experiences and knowledge in the workplace, their cognitive limitations and possibilities, among other things, but teaching activities are carried out in the same way for all students. Another criticism of traditional teaching concerns the fact that content is often taught in a way that is not only predominantly theoretical but mainly in an excessively abstract, generic way that does not apply to a particular situation, with no connection to reality. As a result of the lack of interaction between subject (student) and object (reality), students may find it difficult to carry out the process of deduction, i.e., they are unable to make a connection between what they have heard and everyday practice in the environment where they develop or will develop their practice[13,14].

In order to overcome the limitations attributed to traditional teaching, various teaching-learning methodologies and pedagogical procedures have been proposed, such as those grouped under the heading of active methodologies. This pedagogical approach[15,16] aims to prepare learners for action, so that they can make a connection between what is discussed in the classroom and the reality of their lives and work. It is based on ways of developing the learning process using real or simulated experiences, with a view to successfully solving the challenges arising from the essential activities of social practice in different contexts. According to Paiva et al.[17], teaching procedures

are currently understood to be as important as the learning content itself.

With these assumptions in mind, the initial focus of this research was to find teaching resources to be applied in a 16-hour food GHP course that would bring the teaching process closer to the guiding principles of active methodologies by including teaching resources and teaching and learning processes that were not limited to just talking, listening, taking notes, memorizing, and answering. More specifically, didactic resources related to the content defined for the course that allowed/facilitated interaction/integration between the students, for the consequent reporting and exchange of pre-existing experiences, and that fostered the relationship between the content worked on and the reality of food handling environments.

The aim of this study was to draw up and apply a teaching plan for GHP courses for food services. The teaching plan had as a reference in its pedagogical project the inclusion of didactic resources used in active methodologies and was applied in order to obtain data with quantitative indicators of both the learning of theoretical content and the development of skills and attitudes compatible with good practices in a food handling environment.

METHOD

Sample

The sample of participating students was obtained by convenience, i.e., those who had enrolled in the courses on good practices for food services offered by the educational institution Serviço Nacional de Aprendizagem Comercial do Rio Grande do Sul (Senac/RS).

The courses were held in the second half of 2018 and were aimed at owners and those responsible for handling food in establishments that handle, produce, fractionate, store, distribute and market food, since an order laid down in Ordinance No. 1,120, of September 22, 2015, of the Porto Alegre Municipal Health Department[6], requires participation in GHP courses in order to obtain or renew a health permit.

The course was approved by the Rio Grande do Sul Health Department and lasted 16 hours, taught in four classes, each lasting 4 hours. The classes were held both at Senac/RS and at companies, and always took place in the evening. To carry out the project, the syllabus of the approved course remained unchanged but the teaching plan included didactic procedures based on the active methodology. The course leader, who was also a researcher on the project, was a teacher on the Senac/RS team and was formally authorized to apply the plan.

The teaching plan was applied in five classes, with the students distributed as follows: Class A - 10 students, Class B - 21 students, Class C - 30 students, Class D - 17 students, and Class E - 35 students, totaling a sample of 114 participants.

The project was approved by the Research Ethics Committee of the Federal University of Rio Grande do Sul (UFRGS), and the Certificate of Submission and Ethical Appraisal (CAAE) was No. 81317817.7.0000.5347. Each student previously authorized their participation by signing an Informed Consent Form.

Experimental design

The experimental design was "before-after". The procedures adopted in the experiment were:

- preparation of the teaching plan, covering all the content topics required by the legislation[6,19] and planned including active methodology techniques. A lesson plan was drawn up for each meeting. Two data collection instruments were used: a questionnaire and a text simulating a problem situation;

- assessment of theoretical knowledge about GHP: application of a questionnaire with ten objective, closed questions, the purpose of which was to assess the degree of prior knowledge of the students about GHP;

- assessment of attitudes (ability to identify and solve problems in GHP): printed presentation of a simulation of a problem situation in a food handling environment. In this assessment, participants had to write down whether there were any problems related to food handling and what solution they would come up with for the problems identified. In order to control the answers, 14 attitudes were listed, which were assessed as right or wrong, and for the latter what procedure would be adopted to correct them. In order to avoid bias in the answers due to "recalling" good practice procedures included in the questionnaire, the attitudes assessment test was applied before the theoretical knowledge assessment;

- course application;

- after the course, in order to check whether there were any differences between the attitudes initially recognized as GHP and the theoretical knowledge initially obtained during the course, the same data collection instruments (problem situation simulation and questionnaire) were reapplied. The problem situation and the questionnaire were answered individually by the participants, but at this stage the answers were discussed collectively.

For all participants, in addition to the assessment activities designed for the research, the official final assessment test was also administered, which is compulsory to obtain the certificate of completion.

Data collection instrument: questionnaire to assess theoretical knowledge of GHP

The questionnaire was made up of ten questions that had to be answered as follows: check the true alternative, check the correct alternative, and mark the options as true (T) or false (F) (Chart).

Chart. Data collection instrument – questionnaire.

Good Practices for Food Service Course 16 h

Final Questionnaire
Student:

_____

Date: ___/___/_____. **City:_____**

1. Check the TRUE alternative:
a) Handlers' uniforms must be light-colored, clean, in good repair, complete (hair covering completely, uniform with short or long sleeves covering all personal clothing and without pockets above the waist line, without buttons or with protected buttons, long pants, closed shoes), exclusive to the food preparation area and changed at least daily.
b) The handlers' uniform must be light-colored, clean, in good repair, complete, with long sleeves only.
c) The handlers' uniforms must be light-colored, clean, in good repair and complete. If the uniform is clean, it does not need to be changed daily.
d) The law says that the handler must wear a full uniform (pants, shirt and cap), with no further requirements.

2. List the types of contamination. Write P for physical contamination, C for chemical and B for biological.
a) detergent residue in the cheese ( )
b) hair in the soup ( )
c) _Salmonella_ in the egg ( )
d) plastic in the rice ( )
e) antibiotic residue in the meat ( )

3. Is it correct to say about hand hygiene?
a) Gloves replace hand hygiene.
b) I must sanitize my hands every time I change tasks.
c) Handlers should only sanitize their hands at the beginning and end of work, as they spend the day working with water.
d) Since the handler handles water a lot, there is no need to sanitize their hands when changing tasks.

4. Mark the true alternative:
a) If food falls on the floor during the process, we should wash it and put it back in the pot.
b) If the food falls on the floor we should chlorinate it and then use it.
c) If food falls on the floor, wash it with running water and use it.
d) If the food falls on the floor, we should discard it.

5. How long can we keep perishable food at room temperature before handling it?
a) 2 hours.
b) 3 hours.
c) 30 minutes.
d) 1 hour.

Continuation

Chart. Data collection instrument – questionnaire.

6. Regarding the habits of the handlers, it is CORRECT to state:
a) I can sing in the kitchen, taking care not to get any saliva on the food.
b) Handlers should be removed when they have skin diseases, such as nail and hand mycoses, lesions, and/or symptoms.
c) If the earrings are very small and fit inside the cap, they can be worn.
d) I can wear a cloth around my waist to dry my hands.

7. Check the TRUE alternative about cross-contamination.
a) Handling cooked food with the same utensils as raw food is an example of cross-contamination.
b) When grilling, if I'm wearing gloves, I can handle the meat with the same utensil for raw and cooked food.
c) I should store raw and cooked food on the top shelves of the fridge to avoid cross-contamination.
d) If my food is sanitized, there is no risk of contamination if we put it in dirty utensils.

8. Mark the TRUE alternative about cleaning and disinfection.
a) Cleaning can be done at the time of production.
b) Since the cutlery is washed, there is no need for disinfection.
c) The first stage of sanitization is chlorination.
d) Hygienization is two stages = cleaning + disinfection.

9. It is CORRECT to say about the sanitization of fruit and vegetables.
a) All vegetables to be consumed must be sanitized with water and bleach.
b) Vegetables should be washed with water and then soaked in vinegar for 15 minutes.
c) Raw vegetables and those that do not reach 70°C during the cooking process must be sanitized (washed with running water and then left to soak in a chlorine solution for 15 minutes).
d) All vegetables should be washed thoroughly and the bugs removed before consumption.

10. Check F for false and T for true:
( ) Food served at the buffet can be stored and used the next day.
( ) The temperature of the food upon receipt must be up to 70°C or according to the manufacturer.
( ) We can serve raw eggs (soft yolk), as long as they are well sanitized.
( ) I keep food warm in the kitchen in a hot pass-through or bain-marie so that it doesn't get contaminated and can be used.

Source: Prepared by the authors, 2018.

The content of the questions was about: 1. the handlers' uniforms; 2. what chemical, physical, or biological contamination is; 3. hand hygiene; 4. the procedure if food falls on the floor; 5. how long perishable food can be left at room temperature until it is handled; 6. whether the handlers can wear adornments, sing in the kitchen, tie a cloth to their hands when they are injured; 7. cross-contamination; 8. cleaning and disinfection; 9. sanitizing fruit and vegetables; and 10. the temperature and reuse of the food served at the buffet.

Data collection instrument: simulation of a problem situation to assess expected attitudes in GHP

Course Good Practices for Food Services

Student: Date:

Below is a simulated situation about the procedures adopted by an employee in a restaurant. After reading it, tell us which of the employee's attitudes, from a hygiene point of view, you consider to be correct and which incorrect, and how you would go about correcting them.

Pedrita, a new employee at the "Comida Campeira" restaurant, arrived at work 10 minutes before the start of her first day. She wore a clean uniform (pants, shirt, and apron), and tied her hair back with an elastic band. She wore very little make-up and a small earring.

Pedrita comes out of the changing room and starts work. She starts by sanitizing the salads. She takes the lettuce leaves, puts them in a bowl, washes them with water, and puts them on the counter until it's time to take them to the buffet. Pedrita is asked to help prepare hot dishes, and there will be *a la minuta* on the menu. She takes some eggs from the refrigerator, breaks them into the frying pan, leaves them with very soft yolks, according to the tastes of some customers. She leaves and goes to help portion the dessert. The oldest employee draws her attention because she has to wear a glove. Pedrita is exhausted, having walked from one corner to the other on her first day at work. She feels her feet swelling, pulls up her pants a little and, squeezing her feet, shows them to her colleague. Pedrita leaves and goes to sanitize the benches. She takes her cloth from her apron pocket and wipes down the worktop, then puts it back in her pocket.

Pedrita leaves for lunch and decides to finish her last few minutes on the street. She sits down on the ground under a tree, smokes her cigarette, rests, and returns to the kitchen to replenish the buffet.

The attitudes that should be identified in the problem situation: 1- wearing a cap; 2- removing an earring; 3 - removing make-up; 4- removing a wedding ring; 5- sanitizing hands; 6- sanitizing fruit and vegetable products; 7- storing sanitized fruit and vegetable products at controlled temperatures; 8- not serving eggs with soft yolks; 9- sanitizing their hands; 10- not touching your feet while handling food - after sanitizing your hands; 11- not putting the cloth in your apron pocket; 12- not sitting on the floor in uniform; 13- sanitizing their hands and 14- not wearing gloves.

Evaluation criteria

The evaluation criterion was based on the formation of competencies[19], made up of the following axes: a) knowledge: which is formed through the content acquired in the theoretical classes, at all times during the course; b) skill: which is the demonstration of recognizing, through the knowledge acquired, what should be appropriate in health reality; c) attitude: which is transforming knowledge and skill into action to transform what has been recognized as a problem in GHP.

Statistical analysis

The metrics used to evaluate the results were the mean and median, measures of central tendency. The results of the students' or classes' knowledge (questionnaire) and attitudes (indicated in the problem situation) obtained before the course were compared with the results obtained by them after the course.

The Shapiro-Wilk test for normality and the Levene test for equality of variances were used to compare the data. When non-normality was found to be significant in the distribution of data from the "before" or "after" course, non-parametric tests were used to compare medians - the Kruskal-Wallis test for comparing three medians, and the Mann-Whitney (Wilcoxon) test for comparing paired samples (or two dependent samples). When the data was normally distributed, the t-test was used to compare means.

R software and the ggplot2 and mvnormtest packages were used for the analysis. The significance level was 95%.

RESULTS AND DISCUSSION

Characterization of the sample

The information on the students' level of schooling does not depend on whether or not they have completed the reported grade. Class A consisted of ten students, three from elementary school, five from high school, and two from higher education. In this class there was one student of foreign origin, who had difficulty understanding some of what was said. Class B had 21 students, ten of whom were high school graduates and 11 of whom were university graduates. This class had the characteristic of not having any students with only elementary education, 90% of them had already received training in good practices and 50% of them were store supervisors. Many of them were often restless, using their cell phones several times, because they were on the course but had to solve "problems in the company", according to what they said. Class C had 11 students with primary education, 15 with secondary education, and five with higher education. This class had the largest number of students with only primary education, two of whom had great difficulty understanding and interpreting reading. Class D was made up of three elementary school students, six secondary school students, and eight university students. In this class, 90% of the students were currently starting out in the food business. There were also two students who had great difficulty understanding and interpreting the reading. In class E, five students had primary education, 17 had secondary education, and 13 had higher education. In this class, there were two students who said they were always in "too much of a hurry" and showed resistance to concentrating on the didactic activities. Summarizing the composition of the sample according to level of education: 22 (19.3%) students had primary education, 53 (46.5%) had secondary education, and 39 (34.2%) had higher education.

Implementation of the teaching plan

On the first day of class, the dynamics of the course and the research project were explained. The problem situation was given to the students, and, upon completion, the theoretical knowledge questionnaire was applied. This was followed by a discussion with the whole class, and then the presentation of the syllabus on Power Point® slides.

The theoretical content was developed in a dynamic way, trying to contextualize the students in situations that they would easily encounter in the workplace. The students were given the challenge of developing actions and reasoning to solve problems arising from probable food safety failures.

In the first lesson, the main official regulations on the subject were presented. The "contamination and hazards activity" was carried out in groups, in the form of a crossword puzzle.

In the second lesson, activity 1 was the showing of a video ("FBD: food-borne diseases") in which real cases of food-borne diseases were presented, with one case of death, which served as a "motto" to highlight the problems arising from the failure to implement good practices in food services, as well as to demystify a recurring saying on the part of food handlers: "I've always done it this way and it's never worked". In activity 2, a "case study" on food handling brought three comic strips of common situations in food services, such as food exposed for a long time at room temperature, cross-contamination and the famous lack of time to carry out tasks. Groups were formed so that the students could express what the proper procedure would be, what attitudes they would have. The aim of this activity was to make students see themselves in these situations and realize that keeping food at room temperature for longer than the law allows is a risk to everyone's health. In activity 3 ("Dynamics: hand hygiene"), the students were taken to a hand hygiene area and asked to go through the steps of how they performed this hygiene. The teacher then showed them the proper procedure. And in the fourth and final activity of this lesson, a video was shown ("Chef without hygiene") in which a cook handled food and then there was a discussion with the class. The aim was to get each student to point out which behaviors shown in the video represented a danger in food service. The dynamics applied on the day were set up in such a way that they included visual, writing and movement activities (leaving the room for another environment and doing in practice what had been learned in theory). As each individual learns in a different way, it is important to use most of the senses to keep them connected with the content.

In the third lesson, task 1 ("Activity to assemble a work instruction tool for sanitizing facilities/equipment") was carried out with the aim of getting students to think about how, when and who carries out hygiene procedures. In activity 2, it was proposed that a pair of students perform a "Theatricalization" in which one of them would be an old employee in the company and the other would be an employee in training. The old employee was supposed to teach the new employee how to sanitize the equipment and the other

students could help if the one who was presenting forgot any part of the process. In activity 3, a "Receiving goods" dynamic aimed to get the students, divided into groups, to be able to identify the non-conformities in receiving food and say what the corrective actions would be. Activity 4 was the presentation of an image, "Real photography", so that the group could reflect on the organization of the work environment and propose alternatives to bring it into line with good practices.

In the fourth and final lesson, the "Temperatures" activity was proposed so that the students could remember at what temperature the food should be at the different stages of handling. Afterwards, a video was shown about "An entrepreneur called Valdir Pipoqueiro" who, despite having a relatively simple economic activity in the popcorn cart business, differentiated himself in the market by using GHP.

The group activities were carried out with four students each and, once they had finished, they were discussed in the classroom with the large group. We believe that the receptivity and interactivity produced by the dynamics and activities were very positive, as the students reported that they found the lessons lively and that they would have been able to relate what they had seen in the classroom to what happened in the establishments where they worked. They said things like: "teacher, I didn't know that not sanitizing properly could cause so many problems" or "I arrived at the company taking photos of everything and correcting what was wrong", or even "these activities make us think about how many things we do wrong, without knowing it".

The last activities of the course were the re-application of the assessments of attitudes using the problem situation presented at the beginning of the course, and of theoretical knowledge, using the same initial questionnaire. Finally, the official exam was administered.

Comparison of students' and classes' scores/achievements on the theoretical knowledge questionnaire, before and after the course

Table 1 shows the descriptive statistics of the students' answers to the questionnaire.

The median scores after the course showed that half of the students got 90.0% or more right on the ten questions proposed in the questionnaire. And the overall average number of correct answers after the course was 89.4% of the questions. This meant an increase of 10.0% in the median and 18.3% in the average, compared to the scores before the course.

After verifying that the distribution of data between before and after was not normal, the non-parametric test of equality of medians of two paired samples was used, and the result shows that the median score increased significantly after the course. With similar results, Devides et al.[20] quantitatively assessed the impact of a GHP course on the acquisition of knowledge by food handlers. Using questionnaires before and after the training (without information on the pedagogical model used), they

Table 1. Descriptive statistics of the results of the 114 students who took part in the questionnaire, before and after the Good Handling Practices course.

Running the course	Minimum	SD	Q1	Median	Average	Q3	Maximum
Before	0.00	1.95	6.00	8.00	7.13	8.00	10.00
After	5.00	1.12	8.00	9.00	8.94	10.00	10.00

Source: Prepared by the authors, 2022.
SD: standard deviation; Q1: lower quadrant; Q3: upper quadrant.

Table 2. Average number of correct answers given by the students in the questionnaire for each of the five classes (C) before and after the Good Handling Practices course.

Running the course	C A	C B	C C	C D	C E
			Average		
Before	6.00	7.05	7.32	6.88	7.46
After	8.80	8.86	8.45	9.24	9.31

Source: Prepared by the authors, 2022.

Table 3. Descriptive statistics of the results of the attitudes to Good Handling Practices correctly identified by the 114 participating students, before and after the Good Handling Practices course.

Running the course	Minimum	SD	Q1	Median	Average	Q3	Maximum
Before	0.00	3.33	2.00	5.00	4.63	7.00	13.00
After	0.00	3.99	5.00	8.00	7.56	11.00	14.00

Source: Prepared by the authors, 2022.
SD: standard deviation; Q1: lower quadrant; Q3: upper quadrant

obtained a significantly higher percentage of correct answers in the final evaluation compared to the initial diagnostic evaluation.

Table 2 shows the average knowledge scores per class before and after the course.

Given that the maximum difference between the lowest and highest average number of correct answers between the classes before the course was 1.46 and after the course was 0.86, even though no statistical comparison was made, it can be seen that there is a certain homogeneity between the classes when it comes to assessing knowledge of GHP. The number of correct answers to the questionnaire after the course increased in all classes.

Comparison of correct attitudes identified by students and classes in the simulated problem situation, before and after the course

Table 3 shows the descriptive statistics for the results of the GHP attitudes correctly identified by the participating students.

Considering that 14 (the total number of attitudes) is 100.0% correct, using the median as a reference, it can be seen that before the course half or more of the students correctly identified (as right or wrong) only 35.7% of attitudes, with the upper quadrant having seven correct and the lower quadrant having two. The average number of correct identifications before the course was even lower, with only 33.1% of attitudes correctly identified. Thus, comparing the results obtained with those of

the questionnaire, there is a gap between the results of the GMP knowledge assessment (71.2% of questions correct before the course) and the attitudes assessment, which here is measuring the ability to identify and solve good practice problems in a food handling environment. In other words, this result suggests that demonstrating knowledge (in the questionnaire) about GMP was enough for the students, on average, to correctly point out only a third of the GMP procedures presented in the simulated food handling environment.

After the course, the average number of correctly identified attitudes rose to 7.56 and the median 8.00. The average number of correct answers was practically the same as the median, with 54.0% of attitudes correctly identified. Compared to the correct attitudes before the course, there was a 21.6% increase in the median and a 20.1% increase in the average number of correct attitudes after the course. However, despite the improvement, there is still a gap in the relationship between the assessment of theoretical knowledge and that of attitudes. In other words, even though they obtained a better result than before the courses, it was observed that having knowledge (questionnaire) about GHP was enough for the students, on average, to correctly point out only half (54.0%) of the attitudes that should have been adopted.

In other investigations, asymmetry was also observed between the theoretical knowledge that food handlers had about GHP and the attitude or recognition and adoption of GHP. For

example, Medeiros et al.[21] reported that food handlers in a university restaurant demonstrated knowledge about adequate or inadequate procedures for GHP, but when correlated with the results of bacteriological analysis of hands and personal protective equipment, they observed no correlation with the knowledge expressed.

An integrative review was carried out[22] on the knowledge, attitudes, and practices of food handlers regarding food safety. Thirty-six original articles were consulted and 50% of the research reports pointed to results that indicated that there was no adequate relationship between the level of knowledge and the attitudes/practices observed after training.

The test of equality of variances shows that the variability of correct answers in identifying GHP attitudes before the course is significantly different from the variability afterwards. Applying the test of equality of medians of two paired samples, it can be seen that the median number of correct answers in identifying attitudes towards GHP increased significantly after the course.

In the scientific literature accessed on training food handlers, few studies have reported in detail on the teaching methodologies and didactic resources used, nor on how the participants were assessed, which makes it difficult to draw comparisons with this study. However, in a study with similar pedagogical orientation to the one presented here, which ran a training course in food safety and worker health for shellfish gatherers and researchers[23] and did playful teaching activities such as theater, simulations of hygiene practices and the use of photos of the local reality, it was observed that, in terms of learning, there was an improvement in results, which is similar to the report of the results presented here.

Table 4 shows that before the course, unlike the number of correct answers to the knowledge questions, there was greater asymmetry between the classes. While the average number of correct answers between the classes in the knowledge assessment, the maximum difference between the lowest and highest average number of correct answers, was 10.5%, in the attitudes assessment, the difference between the classes was 23.0% (C E 44.3% - C C 21.2%), for an already low average in attitudes.

Also unlike what happened between the classes in terms of the results of the knowledge assessment, the comparison of the results of the attitudes between before and after the course showed asymmetry. While in the assessment of knowledge about GHP the maximum difference between the classes was, on average, 0.80 correct answers, in the assessment of attitudes between the classes this difference was 4.64, i.e., 33.1% of the attitudes were correctly pointed out.

The number of GHP attitudes identified increased after the course in all classes.

Comparison between students' level of education and knowledge test scores before and after the course

In order to test the hypothesis that the level of schooling of food handlers interferes with the degree of knowledge acquisition and the ability to develop correct attitudes in GHP, the 114 students were classified according to their levels of formal learning. They were distributed as follows: elementary school (ES) 22 students (19.3%), high school (HS) 53 students (46.5%) and higher education (HE) 39 students (34.2%).

The means and medians of the knowledge scores by level of education before the course and after the course were calculated (Table 5).

Using the median measure of central tendency, it can be said (based on the Kruskal-Wallis test) that, before the course, there was a significant difference between the medians of the three levels of education. However, when comparing the levels two by two, using the Wilcoxon test, it cannot be said that there is a significant difference between secondary and higher education.

The Kruskal-Wallis test also shows that there is a significant difference between the three levels of education when comparing the median grades by level of education after the course. However, probably due to the small sample size, when grades are compared two by two using the Wilcoxon test, it cannot be said that the difference is significant.

When comparing the medians of the differences between grades by level of education, using the Kruskal-Wallis test, it cannot be said that there is a significant difference between the medians of the three levels of education. When comparing the levels two by two, using the Wilcoxon test, it cannot be said that there is a significant difference either.

The result observed in the statistical comparisons between the differences in the scores obtained in the questionnaires before

Table 4. Average result of the attitudes towards Good Handling Practices correctly identified in the simulation of a problem situation in a food handling environment, by each of the five classes (C) before and after the Good Handling Practices course.

Running the course	C A	C B	C C	C D	C E
			Average		
Before	5.40	4.67	2.97	3.94	6.20
After	6.20	7.71	5.65	6.06	10.29

Source: Prepared by the authors, 2022.

Table 5. Mean and median number of correct answers to the knowledge questionnaire, completed by the 114 students, before and after the Good Handling Practices course.

	Running the course	Education		
		Elementary school	High school	Higher education
Average	Before	5.77	7.23	7.77
	After	8.23	8.91	9.38
	Difference	2.45	1.62	1.69
Median	Before	6.50	7.00	8.00
	After	8.50	9.00	10.00
	Difference	2.00	2.00	1.00

Source: Prepared by the authors, 2022.

Table 6. Mean and median of the attitudes correctly identified as right or wrong in the simulation of a food handling problem situation, carried out by the 114 students, before and after the Good Handling Practices course.

	Running the course	Education		
		Elementary school	High school	Higher education
Average	before	2.18	4.40	6.33
	after	2.82	7.58	10.21
	difference	0.64	3.19	3.89
Median	before	0.0	4.0	6.0
	after	3.0	7.0	11.0
	difference	0.0	3.0	4.0

Source: Prepared by the authors, 2022.

and after, between the three levels of schooling, allows us to affirm that the courses given with a teaching plan based on active methodologies increased the ability to grasp the content for all three levels of schooling.

Although it was not statistically evaluated, it was observed that the increase in the average number of correct answers was higher among students with less schooling.

Comparison between the students' level of education and the attitudes identified in the problem situation before and after the course

Table 6 shows the mean and median of the attitudes correctly identified as right or wrong in the problem situation simulating the environment and GMP.

When comparing the attitudes correctly identified before the course, by level of education, using the median of the attitudes as a measure of central tendency, based on the Kruskal-Wallis test, it can be said that there is a significant difference between the medians of the three levels of education. When comparing the levels of education two by two, using the Wilcoxon test, it can be said that there is a significant difference between secondary and higher education levels, and between these and primary education.

When comparing correct attitudes by level of education after the course using the median as a measure of central tendency, based on the Kruskal-Wallis test, it can be said that there is a significant difference between the medians of the three levels of education. Comparing the levels two by two, using the Wilcoxon test, it can be said that there is a significant difference between all three levels of education.

When comparing the before-and-after differences between correctly indicated attitudes by level of education, using the median of attitudes as a measure of central tendency, based on the Kruskal-Wallis test, it can be said that there is a significant difference between the medians of the before-and-after differences between the three levels of education. When comparing the levels two by two, using the Wilcoxon test, it can be said that there is a significant difference between primary and secondary education, and between primary and higher education, but not between secondary and higher education.

CONCLUSIONS

When the evaluations applied before the course were compared with those after the course, it was observed that the teaching plan with the inclusion of pedagogical resources from active methodologies provided students with a statistically significant

increase in both the number of correct answers in the question-naire that verified the acquisition of theoretical knowledge in GHP and in the identification of correct and incorrect attitudes for acting in food handling environments presented in the problem situation.

Taking the level of schooling as a reference when comparing the correct answers to the questions in the questionnaire and when comparing the correct answers to the identification of appropriate attitudes for working in a food handling environment,

it was observed that both in the before and after evaluations, the higher the level of schooling of the students, the higher the correct answers.

It was observed that having, on average, adequate theoretical knowledge about GHP, which was demonstrated in the correct answers to the questions in the questionnaire, was not accompanied by an equally adequate average in identifying the correct and incorrect attitudes presented in the problem situation for working in a food service environment.

REFERENCES

1. Leal D. Crescimento da alimentação fora do domicílio. Segur Aliment Nutr. 2010;17(1):123-32. https://doi.org/10.20396/san.v17i1.8634806

2. Bezerra IN, Moreira TMV, Cavalcante JB, Souza AM, Rosely Sichieri R. Consumo de alimentos fora do lar no Brasil segundo locais de aquisição. Rev Saúde Pública. 2017;51:1-8. https://doi.org/10.1590/S1518-8787.2017051006750

3. Instituto Brasileiro de Geografia e Estatística – IBGE. Pesquisa de orçamentos familiares 2017-2018: primeiros resultados. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística; 2019.

4. Constancio MB, Akutsu RCCA, Silva ICR, Camargo EB. Revisão da literatura: alimentação fora do lar e os desafios das boas práticas para a produção de alimentos de qualidade em Unidades de Alimentação e Nutrição UAN. Acta Cienc Saúde. 2016;5(2):129-43.

5. Agência Nacional de Vigilância Sanitária – Anvisa. Resolução RDC N° 216, de 15 de setembro de 2004. Dispõe sobre regulamento técnico de boas práticas para serviços de alimentação. Diário Oficial União. 16 set 2004.

6. Secretaria Municipal de Saúde de Porto Alegre - SMS. Portaria municipal N° 1.120, de 22 de setembro de 2015. Dispõe sobre a obrigatoriedade de participação em cursos de capacitação em boas práticas para proprietários, responsáveis técnicos e pela manipulação de alimentos em estabelecimentos que manipulem, produzam, fracionem, armazenem, distribuam e comercializem alimentos, aprova as normas para homologação dos cursos de capacitação em boas práticas para os serviços de alimentação e dá outras providências. Diário Oficial do Município de Porto Alegre. 10 nov 2015.

7. Góes JAW, Furtunato DMN, Veloso IS, Santos JM. Capacitação dos manipuladores de alimentos e a qualidade da alimentação servida. Hig Aliment. 2001;15(82):20-2.

8. Saviani D. Escola e democracia. São Paulo: Cortez; 1991.

9. Leão DMM. Paradigmas contemporâneos de educação: escola tradicional e escola construtivista. Cad Pesqui. 1999;107:187-206. https://doi.org/10.1590/S0100-15741999000200008

10. Pimenta SG, Anastasiou LGC. Docência no ensino superior. 3a ed. São Paulo: Cortez; 2008.

11. Abreu JRP. Contexto atual do ensino médico: metodologias tradicionais e ativas [dissertação]. Porto Alegre: Universidade Federal do Rio Grande do Sul; 2009.

12. Lacerda FCB, Santos LM. Integralidade na formação do ensino superior: metodologias ativas de aprendizagem. Avaliação. 2018;23(3):611-27. https://doi.org/10.1590/S1414-40772018000300003

13. Libâneo JC. Democratização da escola pública: a pedagogia crítico-social dos conteúdos. São Paulo: Loyola; 2008.

14. Mizukami MGN. Ensino: as abordagens do processo. São Paulo: Pedagógica e Universitária; 2016.

15. Berbel NAN. A problematização e a aprendizagem baseada em problemas: diferentes termos, ou diferentes caminhos. Interface. 1998;2(2):139-54. https://doi.org/10.1590/S1414-32831998000100008

16. Silva RRD. Estetização pedagógica, aprendizagens ativas e práticas curriculares no Brasil. Educ Real. 2018;43(2):551-68. https://doi.org/10.1590/2175-623667743

17. Paiva MRF, Parente JRF, Brandão IR, Queiroz AHB. Metodologias ativas de ensino-aprendizagem: revisão integrativa. Sanare. 2016;15(2):145-53.

18. Secretaria da Saúde do Rio Grande do Sul. Portaria N° 78, de 28 de janeiro de 2009. Aprova a lista de verificação em boas práticas para serviços de alimentação e aprova normas para cursos de capacitação em boas práticas para serviços de alimentação. Diário Oficial do Estado. 30 jan 2009.

19. Conselho Federal de Medicina Veterinária – CFMV. Estratégias de ensino-aprendizagem para desenvolvimento de competências humanísticas. Brasília: Conselho Federal de Medicina Veterinária; 2012[acesso 08 jul 2017]. Disponível em: http://portal.cfmv.gov.br/uploads/files/Estrategias%20de%20Ensino-aprendizagem%20para%20Desenvolvimento%20das%20Competencias%20Humanisticas_site.pdf

20. Devides GGG, Maffei DF, Catanozi MPML. Perfil socioeconômico e profissional de manipuladores de alimentos e o impacto positivo de um curso de capacitação em Boas Práticas de Fabricação. Braz J Food Technol. 2014;17(2):166-76. https://doi.org/10.1590/bjft.2014.014

21. Medeiros MGA, Carvalho LR, Franco RM. Percepção sobre a higiene dos manipuladores de alimentos e perfil microbiológico em restaurante universitário. Cienc Saúde Colet. 2017;22(2):383-92. https://doi.org/10.1590/1413-81232017222.17282015

22. Zanin LM, Cunha DT, Rosso VV, Capriles VD, Stedefeldtd E. Knowledge, attitudes and practices of food handlers in food safety: an integrative review. Int Food Res J. 2017;100(part 1):53-62. https://doi.org/10.1016/j.foodres.2017.07.042

23. Nóbrega GS, Santos MDF, Santos SMG, Cardoso RCV, Fortunato RMN, Góes JAW et al. Formação para marisqueiras em segurança de alimentos e saúde do trabalhador: uma experiência na comunidade de Ilha do Paty, Bahia, Brasil. Cienc Saúde Colet. 2014;19(5):1561-71. https://doi.org/10.1590/1413-81232014195.03772013

Authors' Contribution

Conflict of Interest

The authors inform that there is no potential conflict of interest with peers and institutions, political or financial, in this study.