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The elaboration of food profiles and landscapes as multimodal devices for food education from complex approaches in teacher training

La elaboración de perfiles y paisajes alimentarios como dispositivos multimodales para la educación alimentaria desde enfoques complejos en la formación del profesorado

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ABSTRACT

In a research project, we designed, implemented and evaluated a Didactic Unit (UD) for the training of Teachers in Biology, focused on human nutrition. The aim of this article is to characterize the innovative methodology used to develop Food Profiles (PeA) and Food Landscapes (PA), multimodal devices organized from photographs of eating episodes, which include comments that refer to the conditions in which they are carried out, produced by the students themselves, shared in a social network and organized in a database of the university campus. These devices were used in the classes and allowed them to analyze their eating practices from complex approaches, in a way consistent with the vision of human food adopted, from which the biological/nutritional and sociocultural components are inextricably linked. The results show that the organization and implementation of the methodological device led to the production of a significant inventory of students' eating practices and contexts, which were used as a platform for problematization and analysis in different activities of the UD.

Palabras clave:
perfiles alimentarios, paisajes alimentarios, metodología, educación alimentaria, enfoques complejos.

RESUMEN

En un proyecto de investigación, diseñamos, implementamos y evaluamos una Unidad Didáctica (UD) para la formación del Profesorado en Biología, centrada en la alimentación humana. El objetivo de este artículo es caracterizar la metodología innovadora utilizada para elaborar Perfiles Alimentarios (PeA) y Paisajes Alimentarios (PA), dispositivos multimodales organizados a partir de fotografías de episodios de alimentación, que incluyen comentarios que hacen

	referencia a las condiciones en que éstos se llevan a cabo, producidos por los propios estudiantes, compartidos en una red social y organizados en una base de datos del campus universitario. Estos dispositivos fueron utilizados en las clases y les permitieron analizar sus prácticas alimentarias desde enfoques complejos, de manera consistente con la visión sobre la alimentación humana adoptada, desde la cual los componentes biológico/nutricional y sociocultural se encuentran indisolublemente unidos. Los resultados muestran que la organización e implementación del dispositivo metodológico dio lugar a la producción de un significativo inventario de prácticas y contextos alimentarios de los estudiantes y que fueron utilizados como plataforma de problematización y análisis en diferentes actividades de la UD.

Introduction

Teacher training is undergoing a transformation towards a more comprehensive approach, aimed at developing strategies that enable a comprehensive and multidimensional understanding of complex problems such as human nutrition, and enable its teaching from a multi-referenced approach consistent with this conceptualization of the phenomenon. In this line, a study has been carried out focused on the design, implementation and evaluation of a Didactic Unit (UD) for biology teacher training, which is framed in this teaching perspective and uses Food Profiles (PeA) and Food Landscapes (PA), developed from records of the students' own food practices and contexts, as platforms for problematization and analysis.

Food is a central activity in the daily life of any social group, and its study requires a multidimensional approach that considers biological-health and sociocultural aspects and their close relationships (Contreras and Arnaiz, 2005). In this sense, the use of PeA and PA, allows for the staging of the complexity of the students' ways of eating inside and outside the institution, facilitating a comprehensive understanding of their eating practices and contexts and promotes, in parallel, a metacognitive exercise, since the students themselves plan and carry out the collection of primary data, thus pointing to an epistemic break with the traditional way of conceiving educational research.

The PeA and PA were constructed by the team in charge of the study, based on photographs and posts produced by 60 students from two biology courses at a public university in Argentina, using the social network Instagram with a private configuration and a database of the university virtual campus. The PeA gather all the food episodes of a student for each day of recording and account for individual and identity food choices. The APs bring together all the food episodes of all the students, but referring to a single meal or intake, for example: "Weekend Lunch", and provide a broader and more meaningful view of a group's or community's meals. This approach allows for an in-depth analysis of how food, environments and social interactions are intertwined. The PeA and the PA elaborated were the basis of analysis that initiated and continued the development of the didactic unit, in which the student teachers were able to open up different dimensions: nutritional, sociocultural, neurobiological and meta-scientific, giving rise to a complex and multi-referenced approach to their own food practices (Bahamonde and Lozano, 2023).

Method

Target

The aim of this article is to describe and justify the methodology used for the production of Food Profiles (PeA) and Food Landscapes (PA) using the social network Instagram with a private configuration, as devices that account for the food practices and contexts of students and allow addressing their complexity. We also intend to describe the adjustments made in the process of elaboration and implementation in the classroom and to outline a model protocol for implementation in different educational contexts.

Theoretical and methodological background

Working with photographic images and audiovisual records is a powerful tool in the framework of social research. Working with images implies a challenge and a series of decisions that go beyond the mere illustration of ideas, imagining combinations with

other discourses that allow us to enhance more adjusted ways of capturing reality and strengthen its analytical possibilities. Based on this premise, research in the field of food related to PeA and PA has been nourished by various theoretical-methodological currents that use images or image-text complexes as a central tool for analysis.

One approach that frames the methodological perspective we adopt in our research comes from the ideas elaborated by Kress (2010) about multimodal discourse. This author incorporates the notion of "multimodal complex" that adds to the "mode" image the "mode" writing or other semiotic modes, which give context and action to the photograph. The concept "modal affordance", adapted by Kress (2010), refers to the potentialities and constraints presented by different "modes" to represent or communicate meanings or senses more easily, depending on their particular semiotic resources. In a communication in which only the writing mode is used, impressions, meanings and visual aspects will have to be described only through the semiotic resources of writing, giving rise to a multiplicity of interpretations, mental images and senses, and although the multimodal complex is also susceptible to interpretations, these will be more consistent as they come from the interactions and reinforcements between various semiotic modes such as image, written text, oral narration, audio recording or others.

From this perspective of analysis, and in the field of food education, we identify different lines that are powerful to guide the question of "registration" in our research work: Foodscapes, Food Profiles or Foodstyling, each with its own characteristics and significant contributions to the field.

The notion of "foodscape" has become increasingly relevant in health promotion and public nutrition, as well as in food studies on different populations that use them as tools to describe environments and assess their influence on food choices and behaviors. Mikkelsen (2011), in reviewing the growing number of foodscape studies and tracing the origin of this idea, characterizes and reflects on the various contributions and discusses their applicability in human food research, especially in relation to out-of-home feeding environments such as schools and institutions. In this current, the use of photographs is valued as a means to document and understand the food practices and contexts of students inside and outside the educational environment. This methodology allows researchers to visually and tangibly capture their ways of eating, as well as their preferences, consumption environments and food-related social dynamics. In the article "Nordic Children's Foodscapes: Images and Reflections" (Johansson, B. & Mäkelä, J. & Roos, G. & Hillén, S. & Hansen, G. & Jensen, T. & Huotilainen, A., 2009), self-generated images are used to explore and analyze their individual foodscapes. This study also includes in-depth interviews and focuses on the relationship between children and food, specifically on how they describe and reflect on aspects of their daily lives related to food.

With respect to the perspective linked to Food Profiles, and within the framework of the "Food Profile Project" (2015), primary and secondary school students record all the food episodes they consume per day, in a period of time to be determined. They make their records by creating photographs of each item they consume (while doing so) and record audio that explains the context in which they consume those foods and beverages. The combination of images and audios provides valuable information that constitutes the complete food profile of each student and the circumstances involved in their consumption (Guidalli and Torralba, 2015, Torralba and Guidalli, 2013). The authors argue that these contexts are rarely taken into account in most surveys or research and postulate that this knowledge is fundamental for the development of successful initiatives in the pedagogical, political and/or practical spheres.

Finally, perspective: Foodstyling focuses on the aesthetic presentation of food through culinary styling techniques (Introduction to Food Styling, 2024). Foodstyling is used to create attractive and suggestive visual compositions. This technique seeks not only to document the food consumed, but also to convey information about its preparation, presentation and cultural or social significance. It addresses the aesthetic issue in the production of food images that circulate on social networks to provoke various sensitivities and assessments by viewers.

Together, these currents offer an integral and multidimensional approach that has nourished our research on the educational approach to human nutrition. In particular, the first mentioned perspectives have provided elements of theory and fieldwork that we have adapted or recreated in specific methodological instruments to study the students' PeA and PA from their complexity and to carry out a detailed exploration of their food practices and contexts. As for the Foodstyling perspective, it has oriented the analysis of the data obtained in relation to the aesthetic category within the framework of the discourses associated with the sociocultural dimension (Gracia Arnaiz, 1996).

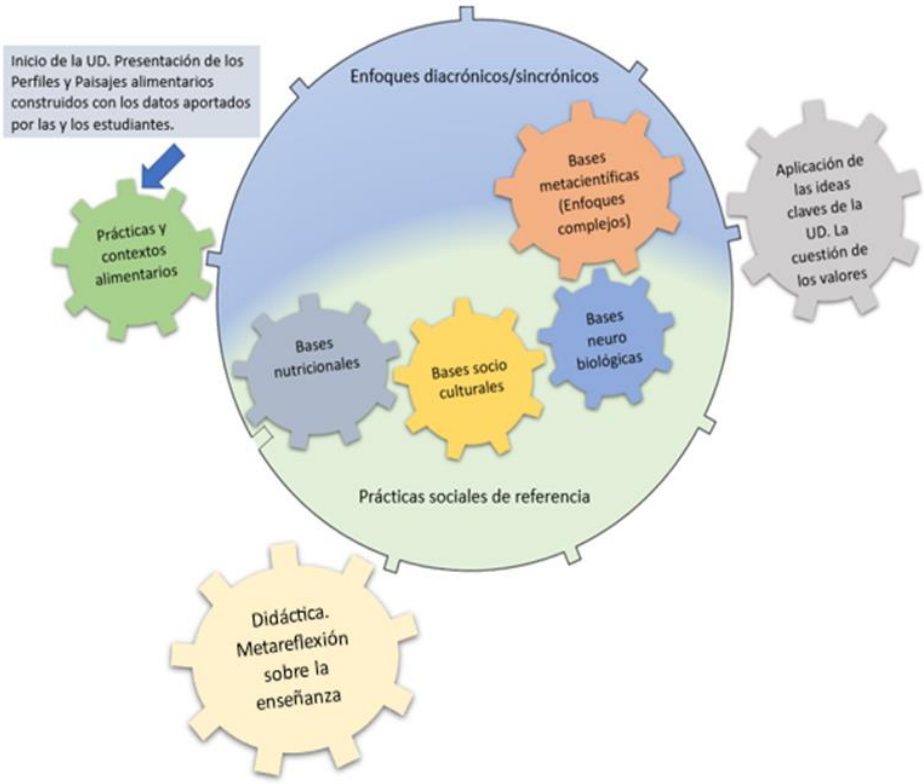
The research we have developed also constitutes valuable background for the present article because it has facilitated the construction of theoretical and methodological knowledge about the ways of eating of high school students in schools located in the province of Río Negro in Patagonia (Bahamonde, N., Lozano, E., Pintos, J. C. and Dillon, L., 2021; Caminos, C., Ferrari, M., Bahamonde, N. and Lozano, E., 2021) and compare them with research carried out in other cultural contexts, for example, with high school students in Mexico (Matus Matíaz, A. 2024) and with university professors in Brazil (Bahamonde, N., 2024).

The Design of the UD

The design of the Didactic Unit (DU) included a series of activities that guided students in the analysis of food profiles (PeA) and foodscapes (PA). These activities focused on developing modeling processes of key ideas in various disciplinary fields, such as nutrition, anthropology, neurobiology and the nature of science. Interactions between these fields were promoted, facilitating the establishment of relationships between them from diachronic and synchronic perspectives. This implied considering the phenomenon "in history, in the present and in future projections", as well as in different contexts, societies and cultures. In addition, reference social practices and diverse performance profiles were identified (see Figure 1)

Figure 1

General plan of the development of the DU. Disciplinary fields involved and sequence of tractions between them.



Methodological Device

The general methodology of the research is guided by a qualitative approach, and the data are obtained from the implementation of a DU in the natural context of the classes, in charge of the teachers of the different disciplinary spaces (Taylor, 2014) Now, within the framework of the background presented, the key aspects of the methodological device that we designed for the elaboration of PeA and PA are the following:

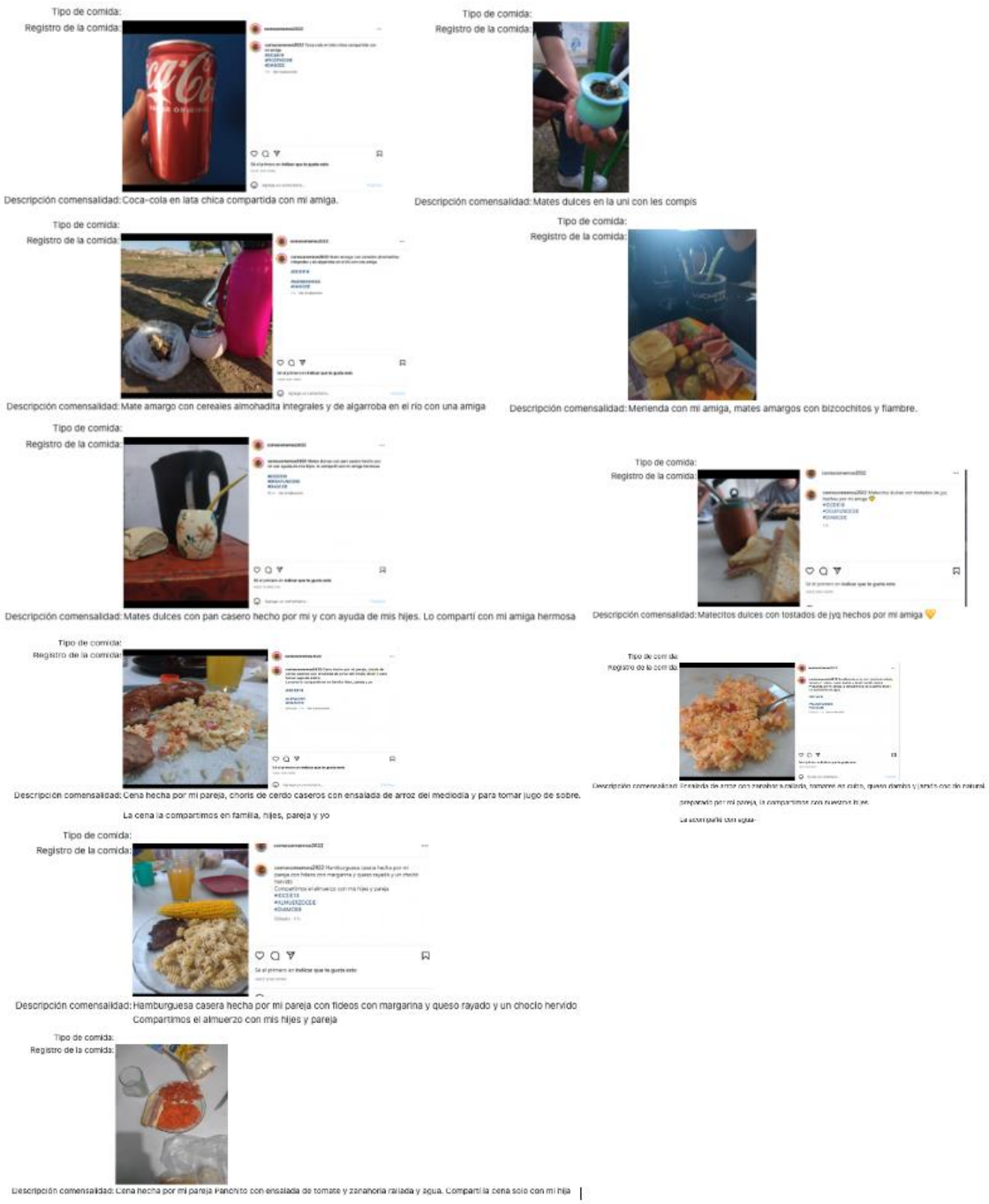
1- The consideration of a basic unit of registration: the "annotated image". It is an individual production of each student that involves the photographic record of the content of a food episode and an attached commentary in which he/she describes: the content of the food, if he/she is alone or accompanied, if it is self/family made or if it is purchased and in which place he/she is eating. It also contains a # that identifies the episode: #breakfast; #pickle; #lunch; #mid-afternoon; #dinner

Figure 2
Sample post for a dinner party, weekday.

2- The use of the social network Instagram, in a private configuration, for students to share the commented images and the sending to a database in the university's virtual campus.

3- Work on the database for the elaboration of the Food Profiles (PeA). It involves gathering in a single record and for each student, all their annotated images. In this way, the database has all the students' PeA.

Figure 3
Food Profile Example (IDCEIE18)



4- Work on the database for the elaboration of the Food Landscapes (PA). It involves gathering in a single record all the annotated images corresponding to a #. For example: "PA #weekenddaydinner." In this way, the database has all the APs for each type of food.

Figure 4
Example of Food Landscape: weekend daytime dinner.

5- Organization of all registration units in the virtual site of the campus: annotated images, PeA and PA, in the form of: "inventory of food practices and contexts" of students, for access and use.

In this way, the methodology developed, attends to the idea of "multimodal complex" (Kress) and gives students a central role in the research (Johansson et al., 2009), getting involved in the elaboration of the devices that will later be used in the classes to think in a complex way about human nutrition, a task that goes beyond the conventional formats of the surveys they usually answer to provide information about their diet, generally of a nutritional nature.

In summary, "annotated images" are organized from the perspectives of "food profile", which is singular and identitary for each individual (Guidalli and Torralba, 2015), and "food landscape" (Johansson et al., 2009; Mikkelsen, 2011; Torralba and Guidalli, 2013), which allows a more meaningful description and interpretation of what and how the students as a whole eat, allowing to infer traits specific to the community.

Analysis of the process of elaboration and implementation of the methodological device

Previous preliminary studies (Bahamonde et al 2021), in which work began with a methodology close to the one mentioned above, made it possible to identify different aspects that appeared as problematic for the development of activities that would result in a quality production, expressed in PeA and PA that could be used as platforms for analysis in the development of a didactic unit on food education in teacher training.

The following is a review of the most significant aspects and their resolutions.

-On the choice of the social network to share each student's registration units

The first implementation of the PeA and PA production methodology was carried out in the framework of a research conducted in 2018, with students from high schools in northern Argentine Patagonia (Bahamonde et al 2021). There, two basic aspects were established in its development: that students would use the Instagram social network for the registration and communication of the commented images, in a private configuration, and that a system of hashtags would be used to characterize various aspects of the content and to facilitate its addressing and processing in the database. These aspects provided a solid basis for informing and re-discussing the design of the methodological approach for the new research project. In this framework, two central aspects were discussed again: the continuity or not with the use of a private and anonymous profile to share the commented images and the continuity of the work on Instagram in the light of a comparative study with other platforms.

Regarding the first question, the axis of the discussions revolved around which of the two options guarantees that students share "more real images" of their eating, since the sense of the organization of the inventory of practices and contexts in PeA and PA to be used in the development of the UD, is to provide scenes that students can recognize as their own and close to what happens daily with their food and not an intervened version due to the level of public exposure that implies "showing what they eat" on a daily basis, that is, practices conditioned by time, academic and/or work activities, economic, family organization, etc. As will be shown in the discussions, an evaluation of the methodology carried out with a sample of participating students at the end of the development of the UD, resulted in a consistent vision with the proposal linked to using Instagram in an anonymous version and different from the one for personal use, which the students possess.

Regarding the second question, a total of six applications were analyzed: WhatsApp, Snapchat, WiSaw, Vero, Discord and Instagram, highlighting both their advantages in facilitating activity and the disadvantages that could hinder it. In this process, priority was given to anonymity, the usability of the application and the ability to form galleries with the participants' annotated images. From the analysis, it was observed that WhatsApp allows forming groups and sharing photos, but lacks anonymity. Snapchat is anonymous but images are deleted after 24 hours. WiSaw offers total anonymity but does not allow closed groups. Vero is anonymous and organizes photos in albums, but is not well known and could present familiarization problems. Discord is also anonymous and allows you to create communities, but it is complex to use and has reliability issues. Within this framework, it was decided to continue using Instagram due to its ease of use and familiarity among students, combined with its ability to maintain anonymity and organize images in galleries. These characteristics made it the most suitable option to carry out this specific activity, guaranteeing efficiency and consistency in data collection, with the condition of using a single account and that everyone install it on their devices and post from it. As each one has a user, which is randomly assigned during the period of organization of data collection, anonymity is maintained, but the profile of each individual who posts can be identified.

-Regarding the previous training that students must have in order to meet the objectives required by the methodology

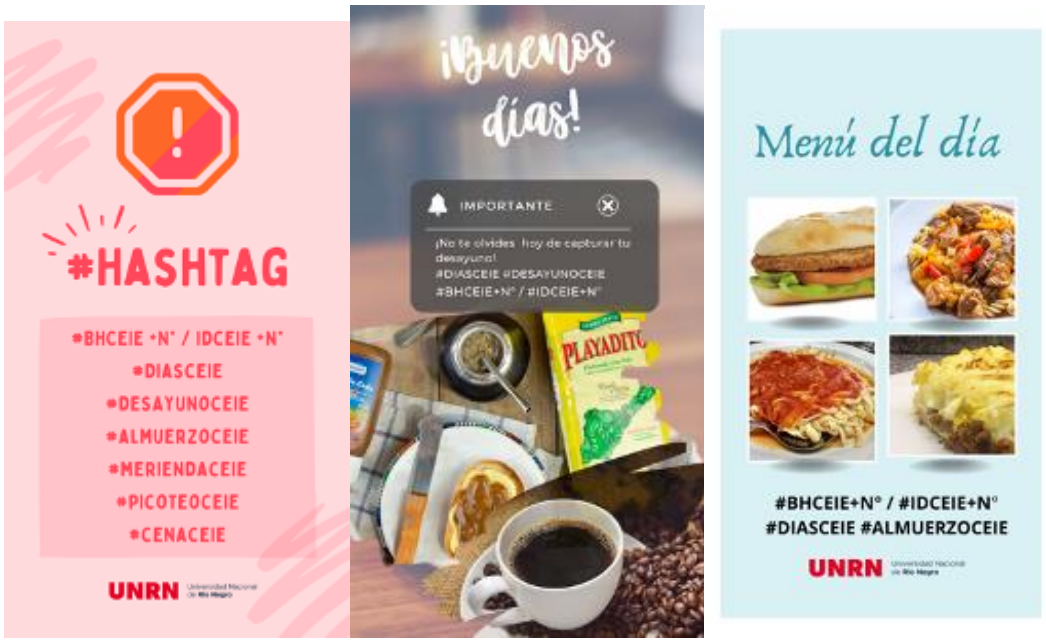
When students are summoned to perform an assignment using social networks, they face a series of obstacles due to the fact that the daily use of these platforms is mainly oriented to recreation and not to the development of academic tasks. This disconnect

between playful and academic use can hinder the effective integration of social networks into learning. This tendency to associate social networks with entertainment may generate resistance or a lack of seriousness when using them for academic purposes, thus limiting their potential as an educational tool (Junco, 2012 Lam; A.H.C., Ho, K.K.W. and Chiu, D.K.W. 2023), In attention to this aspect, and from the difficulties encountered in the implementation of the first version of the methodological device in 2018, it was considered appropriate to develop a brief training program so that students could arrive at the days indicated for the recording and production of the annotated images, with a good understanding of the task to be performed and the sense that the task had.

1. A general introduction to the research project was made. Basically, the general sense of the work to be carried out and the objective of obtaining data that would allow characterizing their eating practices and then being able to use these data in the development of a teaching sequence were presented. Emphasis was placed on the value of educational research in the context of teacher training and on the importance of achieving active and committed participation by the group. At the end of this stage, in which a general introduction of the work methodology was made, all students gave the ok and thus enabled their participation in the task.
2. Students were asked to verify that their cell phones were able to load the Instagram app, and then add a new profile, in this case the one for the research team's joint account.
3. Then, an identification code was randomly assigned to each participant in each subject (in this case, the subjects were coded on the course list based on a number assigned to each subject). It was performed by someone outside the research team and the record was kept on file. Thus, for each post on the common account, the first # they had to place is the subject's ID. (Ex. #BHCEIE15. #BH: student of the Human Biology course. CEIE: Identification of the account of the Center for Studies and Research in Education. 15: The identifying code randomly assigned to the student)
4. Then, to prove that the social network allowed posting from the same user at the same time from different devices, the group of students was asked to synchronously log in and make a post.
5. The use of all the other necessary #'s was also indicated: types of food and commensality data. At that time it was emphasized that forgetting a # implied loss of information.
6. They were informed that on the days destined to produce the images mentioned above, flyers would be uploaded to the account, as alerts, with the tasks for that day. (See image...)
7. Finally, and as a general recommendation, it was emphasized the need for the annotated images that they would elaborate, to stage "the reality of the daily feeding" that they carry out on a weekday and a weekend day, since otherwise, the general objective of the research would be distorted.

Figure 5

Examples of three flyers from the day the fieldwork began. 9 flyers were produced for each work day



-On how to receive and organize the registration units to prepare the APs and OPs

One of the most important modifications of the methodology implemented in the 2018 study was the creation of a database on the university virtual campus for the reception and organization of the annotated images, in an "inventory of food practices and contexts" of students that contains, in addition to each annotated image, the PeA of all students and the PA of all # by type of meal (breakfast, snack, lunch, snack, dinner)

Thus, using the university's virtual classroom, which is hosted on Moodle and has the functionality of the Database activity, allows researchers:

1. Centralization and organization: We have a centralized environment where researchers can store and organize all the fieldwork data and at the same time aggregate the Didactic Unit classes of each of the spaces participating in the research in a single accessible place.
2. Remote access: Being online-based, the UNRN virtual classroom allows researchers to access data from anywhere with an Internet connection, facilitating collaboration and teamwork even at a distance.
3. Ease of search: The Database feature in Moodle allows advanced searches of the data using different criteria, which simplifies the task of finding specific information within large data sets.
4. Security and access control: being on the university campus, the security options were already in place. The researchers controlled who had access to the data and what actions they could take, ensuring the confidentiality and integrity of the information.

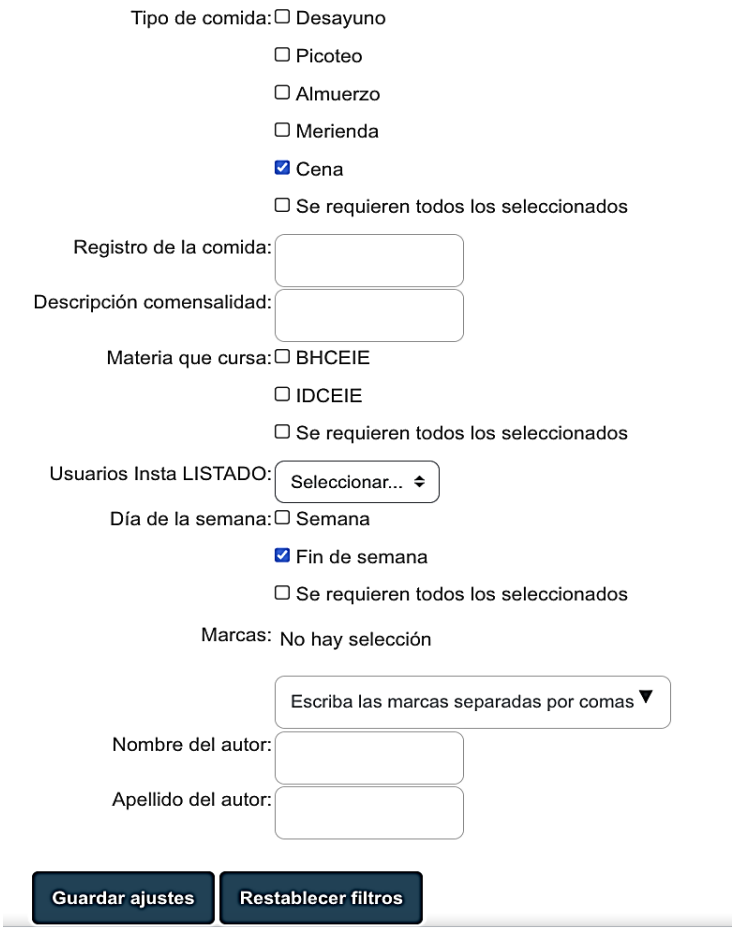
This decision, to dump the information into the campus database, allowed us to organize each post using tags (folksonomy) (See Figure...). This facilitated the search and analysis of the information according to the needs of each researcher, something that was not possible with versions used in the previous fieldwork, such as Google Photos or Flickr. The tags match the hashtags used in the original posts, including the description of the meal, the student's subject, the day of the week of the sample and the type of meal. This flexible organization made it possible to interweave various search criteria in an efficient manner.

This advanced search capability facilitated the construction of the PeA and PA, and easier and faster access to contextualized data, e.g., it was possible to examine students' food preferences according to the day of the week or to identify differences in eating patterns between lunches and dinners. And finally this favored collaboration between researchers, from data uploading to data analysis.

It also presented some disadvantages or obstacles that it is interesting to be able to foresee for another implementation (the need for manual loading of the data, for example, each individual commensality post in the database is a laborious and error-prone process). To avoid errors, a data review and verification process was necessary, consuming additional time and resources. The use of the UNRN platform and the database it offers was undoubtedly central to the development of the research task.

Figure 6

Database screen for access by researchers



Results

About the PeA and PA elaborated

From the implementation of the methodological device, 52 students from two courses of the Biology Teacher Training course, elaborated 360 posts corresponding to all the food episodes of a weekday and a weekend day: 79 breakfasts, 82 lunches, 64

snacks, 75 dinners and 68 hors d'oeuvres. This resulted in the creation of 52 Food Profiles (PeA) and 18 Food Landscapes (PA), corresponding to the categories of #breakfast, #pickle, #lunch, #snack and #dinner. The PeA and PA recording units were printed and available to students at the beginning of the didactic unit activities.

On its use in the implementation of the didactic unit

The PeA and PA were used as input for analysis in the following DU activities:

- Analysis of various APs to open discussions at the beginning of the didactic unit. The students formulate questions and concerns based on the contents of the AP and group them by topic. This gives rise to a first "interdisciplinary Islet of rationality and reasonableness" (Lozano et al., 2016) with dimensions of analysis that go beyond classical health nutritional issues.
- Nutritional bases. Analysis of PeA and PA from "the principles of healthy eating" (balanced/varied diet, proportion/harmony, quantity, adequacy, distribution, water consumption). From the data, graphs similar to those proposed by the Dietary Guidelines for the Argentine population (Ministerio de Salud de la Nación, 2019) are elaborated based on weighting the predominant food groups and comparisons and evaluations are made.
- Socio-cultural bases. Two antagonistic PeA and PA are analyzed from the different discourses on human nutrition (tradition/identity, exotic difference/distinction, progress/modernity, commensality, aesthetics, among others) (Gracias Arnaiz, M., 1996)
- Neurobiological basis. APs are used to select meals and justify the reasons for the choice. This gives rise to the development of complex neurobiological models linked to the bio-psycho-social components of feeding (Beaulieu, K.; Blundell, J., 2021).
- Application activities. A PeA is used to discuss its content from a complex and multi-referenced approach.

Discussions and Conclusions

The results obtained lead us to positively evaluate the methodological device implemented, since it allowed us to have multimodal recording units that illustrated the food practices and contexts of the students themselves. In these registers, "what is eaten" is inextricably linked to "how it is eaten", "in what place", "with whom", and "who prepared it", and this semiotic quality is consistent with the complex approach that guided the design of the didactic unit and also with the theoretical vision adopted on human nutrition.

The PeA and PA also proved to be apt to favor recursive analyses between the identity and the group/community, based on the theoretical models provided by the different dimensions involved in the didactic unit, giving rise to emergents that resignify the feeding scenes that these devices initially portrayed (Figure 7)

Figure 7

Devices, dimensions and recursivity of analysis

Another aspect of interest is related to the level of involvement students have in the task of recording and commenting on their eating practices. We consider that this condition is at the basis of the development of learning motivations, by virtue of the relevance and significance that the content to be analyzed in the classes acquires for them (Tinto, 2021). In order to obtain information on the students' vision, once the implementation of the DU was completed, and based on the development of in-depth interviews with a random sample of 25% of the students, it was possible to highlight some aspects of the methodology used.

The totality of the interviewees expressed positive academic emotions (Pekrun, et al. 2002) and considered the work carried out to be of interest. Table 1 shows some of the students' reflections on this aspect.

Table 1

Students' views on the use of the social network for posting

how did you live the experience of using a social network to post commented images of your meals?	*"I liked that proposal because we could see everyone's meals and it was good because it was also a tool that made it easier for us since we had to upload the images and it was very interesting, I really liked that methodology"*
	"As an experience it was something new, it was a different job that at first I did not make sense, but when I started working with these landscapes in the classroom and the activities that were performed was very interesting, it was a very good experience and I realized in my case how it changes the way we eat when we are accompanied, for example"
	"It was good, it makes you think a little bit about what you're eating, it was a fun experience all in all. It was weird to have to take pictures of the food before eating, but well, maybe because you're not used to it or you don't give much importance to what you eat"

	"It was pretty straightforward and fun. It was also good to compare the meals of a colleague who is on a diet, who has little time, who comes to study and that was good when we were in a group and we discussed these things."
	"Yes I liked it, I liked the implementation of that DU but it was true that there were times when I ate late and I forgot to take the picture and it was like I had to serve it again on the plate to make it look good for the picture."

Another issue that was inquired about, was related to the condition of working in an institutional and shared Instagram account and not in the personal one of each one of them. Also, all the students stated, to a greater or lesser extent, that they would have introduced changes to the commented images, basically, to improve the photos by using filters, making it explicit that it was an academic task, or modifying the content of the meals to project a healthier image. These data validate the methodological option of carrying out the work under privacy conditions.

Table 2 shows some of the students' reflections on this aspect.

Table 2
Student reflections on the use of personal Instagram account.

if you were to use your personal Instagram to accomplish the same task, would you modify anything?	*"And it depends on how one always shows up. If you don't hide, that is... if you are transparent, I don't think so, but well, the social network allows you to show something... what to show and what not to show, that's what it has, so yes, it would have been different from my profile"*
	"No, but in the description of each photo I would have put that it was a faculty activity, the name of the subject and so on, but then nothing. I wouldn't have put a filter or anything, because the purpose of the activity was to be honest about what you ate. I'm also not worried about what my followers might think about what I upload."
	"No, I would still be honest with my food, maybe not, if I had changed, but more than anything the way of taking the picture, setting the table, the plate, so that it comes out better. I wouldn't have added emojis or anything like that, but maybe a filter to intensify the colors of the food, but the food itself will remain the same."
	"I think posting pictures of the food I was eating on my own Instagram would have made me change what I was eating a little bit, I don't know, make it look a little bit healthier or make what I was eating look better."

> *"If given a choice I wouldn't have done it, but in case I had to do it again on my Instagram, I'd probably put some filter on it, I'd sort things more aesthetically pleasing."*

In this line, it would be of interest to open a new dimension in future research, related to the description and analysis of everything that students think, feel and communicate in the period in which they are making records of food episodes to send to the database. Our hypothesis is that, from that moment on, students begin to develop an inquiring, critical and complex view of their food.

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