

# Studying in Virtual University: an approach to students' technopedagogical profiles

## Estudiar en la universidad virtualizada: una aproximación a perfiles tecnopedagógicos de estudiantes

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### ABSTRACT

#### Keywords

Remote education;  
technopedagogical  
profiles; learning;  
university students

This article presents some findings of ongoing investigation on preferences and activities of university students in an emergency remote education context. A qualitative research was developed through the application of two controlled instruments (questionnaires), and a more productive one (recordings of testimonies). The main contribution of this work is the identification of three student profiles based on the strategies they develop to study with technologies in their personal environments. They are known as Gutenberg, Amphibian, and Maker profiles, and some of the main characteristics of their techno-pedagogical practices are described here. The Gutenberg profile defines a group of students whose study practices and preferences are fundamentally linked to analog technologies; the Amphibian profile is defined by the combination of analogical and digital strategies, however, there is an emphasis on the emulation of analog practices. Finally, Maker profiles prefer digital technologies and they are able to recreate teaching resources into new digital objects. The results indicate that students appropriate technologies in a particular and flexible way, which puts in tension the categories native digital and millennial, since preferences and activities seem to show the presence of analogical practices along with other emerging ones.

### RESUMEN

#### Palabras clave

Educación remota;  
perfiles  
tecnopedagógicos;  
aprendizaje;  
estudiantes  
universitarios

*Este artículo presenta algunos hallazgos de una investigación en desarrollo sobre preferencias y actividades de estudiantes universitarios en un contexto de educación remota de emergencia. La metodología que se desarrolló es de tipo cualitativa, a través de la aplicación de dos instrumentos cerrados (cuestionarios) y uno abierto (se solicitó la producción de audios con relatos). La principal aportación de este trabajo es la identificación de tres grandes categorías que permitieron organizar las estrategias desarrolladas por los estudiantes durante 2020; estas se denominaron como perfiles Gutenberg, Anfibio y Maker. El perfil Gutenberg define a un grupo de estudiantes cuyas prácticas y preferencias de estudio se vinculan fundamentalmente con tecnologías analógicas; el perfil Anfibio se caracteriza por una combinación de estrategias analógicas y digitales, con énfasis en la emulación de las primeras; mientras que los estudiantes Maker prefieren las tecnologías digitales y son capaces de recrear los recursos didácticos hasta convertirlos en nuevos objetos digitales. Los resultados indican que los estudiantes se apropian de las tecnologías de modo particular y flexible, lo que pone en tensión las categorías nativo digital y milenial, ya que las preferencias y actividades parecen mostrar la presencia de prácticas analógicas junto con otras emergentes.*

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## INTRODUCTION

To investigate learning is to be encouraged to disassemble a black box, especially in times of such major change as it has meant transiting through a pandemic, with its consequent physical and social isolation. Little is known about what students have accomplished in the privacy of their rooms, desks, and screens when studying in an emergency remote learning context (Hodges *et al.*, 2020); however, according to the research mapping conducted by Bond *et al.* (2021), although the general topic of teaching in virtuality is driven by the current covid-19 situation, several results of this review coincide with pre-pandemic research in the field of educational technology. This is the case of the present article, whose design was conceived prior to the pandemic and then adapted to the new and changing conditions of university higher education.

Of particular interest in the mapping is one of its findings: most of the studies are oriented to collect the perceptions of students about the change in online teaching and learning, and to a lesser extent of professors.

Stakeholder opinions, experiences and perceptions were assessed and considered, particularly through the use of surveys, but less so actual learning behavior, grade differences or changes in student performance. This is not surprising, as this type of research is easier to conduct - especially in the given circumstances - and is still informative about how students experienced the first few months of the pandemic. This finding is also in line with the fact that most studies were cross-sectional and employed descriptive statistics rather than more complex analyses (Bond *et al.*, 2021, p. 17).

The research in which these advances and reflections are framed involved a study with few cases, which prioritizes the in-depth look from a more qualitative perspective. The question that guided the inquiry since 2019 was: what activities do students perform and what preferences do they express for learning in virtual environments at the university? During 2020, the original question was maintained, in addition to contemplating that this was a special moment of important changes, based on the implementation of emergency remote teaching at the university (hereinafter, ERE) (Hodges *et al.*, 2020).

The educational experience abruptly shifted to the virtual environment, which generated tension in the usual ways of teaching and learning. Virtual classrooms were transformed into content repositories, universities interrupted their normality and opened the way to a novel experience for teachers and students (Cannellotto, 2020; Igarza, 2021). Faced with this, aspects on student activities and preferences assumed a more urgent character: how did they study in a context of ERE, in the face of a conjunctural situation, the result of a circumstance of crisis, which involved at first the transfer from the face-to-face modality to virtuality? (Hodges *et al.*, 2020).

To answer this question, methodological decisions were made that oriented the fieldwork towards a search for qualitative material, prioritizing the recovery of the student's word through short stories that were then processed to find recurrences and differences. In spite of the fact that "each student is a world", an attempt was made to organize the diversity of study practices, which were substantially altered in 2020.

### SOME CONCEPTUAL CLARIFICATIONS

Fenstermacher (1997) and Litwin (2008), among other authors, highlight the idea that teaching is not synonymous with learning. From this perspective, we believe that the virtual proposals designed by teachers, function as a regulatory framework for the student's action; however, the decisions and actions that the student develops in his learning process go beyond the regulation that is intended to be installed from teaching. In this sense, learning is understood as those actions performed by the student to appropriate a content (Fenstermacher, 1997); likewise, it is recognized that studying is not synonymous with learning.

In the context of ERE, virtual environments have assumed greater prominence, which are defined as spaces hosted on the web and have two important characteristics for the present study: 1) they are technological platforms with their consequent datification process (Van Dijck and Poell, 2018), and 2) they are formed from a set of computer tools that enable didactic interaction (Gutiérrez, Rodríguez, 2018). From this, the virtual classroom, WhatsApp and social networks are investigated in general terms. Students interact in these spaces in a situational way, conditioned by the teaching proposal and by their interests and personal situations. Assumptions of the sociocultural approach (Wertsch, 1985) on learning are taken up, which form the basis of the research design:

- Learning is produced through continuous interaction with others (teachers and peers) and in relation to specific contents, so we seek to know the actions that students perform in these instances of interaction.
- The interaction is promoted by a set of activities that, through the instructions, work as mediators in the access and production of knowledge. The environment and the activity instructions can function as a prescriptive framework for action.
- Learning always assumes an active subject, who carries out actions to learn (we refer here to the notion of *studenting*).

Students learn to develop different activities: seeing, listening, reflecting and acting, reasoning logically and intuitively, memorizing and visualizing (Felder, 1993).

Some students prefer graphic representations and remember better what they see, others prefer audio materials and remember better what they hear, while others prefer text and remember better what they read. There are students who like to be presented first with definitions followed by examples, while others prefer to have abstract concepts illustrated first with a concrete, practical example. Similarly, some students learn more easily when confronted with hands-on experiences, while others prefer traditional lectures and need time to analyze things. Some students prefer to work in groups, others learn best alone. These are just a few examples of the many different preferences related to the mode of perception, information processing and organization, reasoning, social aspects, etc., all of which can be included in the concept of learning style (Popescu, 2009, pp. 187-188).

These activities are part of the *studenting*, in terms of Fenstermacher (1997). Practices that take place in specific contexts (now virtual) and that are recognized in at least three models that propose to analyze the learning activity in its socio-educational context: 1) the community of inquiry framework model (the community of inquiry framework), developed by Garrison *et al.* (2000); 2) the joint activity theory model, presented by Coll and Onrubia (2008); and 3) the online interaction learning model (OILM), proposed by Benbunan-Fich, Hiltz and Harasim (2005).

These perspectives, as a whole, assume an interaction with knowledge, asynchronously or synchronously, and recover the place of the learner based on his or her mental commitment to the learning process. Even if it is recognized that other actors, contents and devices (tools, resources, tasks and instructions) intervene in learning, it is proposed to focus on the activities that students carry out to learn as an objectifiable process for analysis.

From this, two analytical categories help to delimit the analysis: 1) strategy, which corresponds to flexible procedures that may include specific techniques or operations that the student performs intentionally, adapted to each context, whose use is influenced by internal and external motivational-affective factors (Díaz Barriga and Hernández Rojas, 2010); 2) learning style, which refers to cognitive traits related to the way in which students structure content, form and use concepts, interpret information, solve problems and select means of representation.

From a holistic stance, Fariñas (1995) proposes that styles could be defined as the relatively stable ways in which people learn, through which the unique and unrepeatable character of the personality is expressed, the unity of the cognitive and affective, in addition to their preferences when perceiving and processing information. Pantoja, Salazar and Meneses (2013) present a classification on models that debate between cognitive and learning styles; their article orders the state of the question and allows us to recognize the breadth of the approach that should be sustained throughout the present study. Of the categories proposed, for the purposes

of this inquiry, "styles based on experience", mainly recovered through the senses, and "styles based on the channels of perception of information" are taken up again.

By virtue of the research object proposed, which seeks to identify the preferences and activities that students perform when studying in a virtual environment, this research stage is considered to recover their experiences (activities) and the perception channels (in this case, of access to information) that they choose as a self-perceived preference. For this purpose, some dimensions of Felder and Silverman's (1988) model were taken up again, as well as a later work by Felder (1993), where five questions were formulated that originate the dimensions on different ways of receiving and processing information that have been useful for designing the fieldwork. In addition, the unified learning style model (ULSM) of Popescu (2009) was retrieved, as it was specifically adapted for e-learning environments.

It was proposed to recognize students' activities and preferences for learning in virtual environments in an ERE context, without attempting to pigeonhole or classify the student into a single learning style category. The concept of technopedagogical profile is appropriate to the approach that we intend to give to the analysis of the data, based on the understanding that in each situation the student deploys different strategies, depending on his context and his particular needs. This can be called profiles, which has at least two interpretations: as an outline or figure, a feature that allows the detailed description of the characteristics of a person; or from the sense that profiles acquire in social networks, "a profile that is constructed, modified and updated in a plural narrative, which seeks to be meaningful, based on the changes that rapidly occur in everyday life" (Del Prete and Redon, 2020, p. 2). In this research, both conceptions were considered to define the proposed technopedagogical profiles.

Likewise, the notion of maker culture is taken up again to analyze the study practices of university students, which refers to a movement characterized by the growing irruption of (co-)creation, (co-)design, creativity and innovation as engines for the construction of communities that share a commitment to making rather than consuming. This emphasis on creation and the active participation of its members has made it possible to recognize in this movement a potential for transforming how and what people learn, which places at the center of inquiries what students create in order to learn (Peppler and Bender, 2013).

By applying this concept to organize the activities students engage in and their preferences into broad categories, a dialogic relationship between the technological designs of virtual environments and pedagogical strategies is proposed. "It is not a simple adaptation, but a process in which reciprocally tools facilitate practices and practices are created in order to make better use of the new possibilities offered by technologies. It is

important to understand this relationship" (Gross and Nogra, 2013, p. 139). These technopedagogical practices are supported by the early exposure of technologies by the young generations in a habitual and natural way in the environment in which they live.

University students are usually identified as digital natives (Prensky 2001), millennials or Net generation. "Digital natives are those people born from the eighties onwards. They are inherent to new technologies and the natural use of digital devices. They are considered digitized, except for accessibility causes derived by the economic variable" (Granado, 2019, p. 27). If technologies are part of the natural sociocultural fabric of university students, how is this observed in the preferences and activities that they perform to learn in environments of high technological disposition? (Maggio, 2012).

## METHODOLOGICAL ASPECTS

### Objective

We propose to identify some activities and preferences of students when studying in an ERM context, with the intention of recognizing recurrences that allow us to outline a typology of technopedagogical profiles.

### Research design

Based on a qualitative methodology on the object of study, this exploratory type of research was carried out from an incidental non-probabilistic sample of students who agreed to participate in the questionnaires. In June 2020, students from different curricular areas of the National University of Córdoba, Argentina, were randomly summoned, which resulted in a group of 70 people who were part of the study. It was not intended to generalize the results, so the number of the sample was determined by the team's capacity to process the field material.

Of the total group, ten students were taking the subject Educational Technology at the Faculty of Philosophy and Humanities of the National University of Córdoba, located in the fourth year of the curriculum of the Education Sciences degree program. This article reflects the results obtained specifically among the students of this curricular space.

For the analysis of these data, the criteria for the inclusion of participants considered only two aspects: 1) it was aimed at regular students of the subject Educational Technology during the data collection process (June 2020), and 2) those who wished to participate had to give consent and express their willingness to respond to the three instruments applied. Although some members of the teaching staff were part of the research, the instruments were not applied or analyzed directly by the teachers in charge.



Data collection instruments used were two multiple response questionnaires and a testimonial in audio format, for which they were asked to recount their study strategies, practices and preferences at the time of the consultation.

- Questionnaire 1: your study practices
- Questionnaire 2: your study preferences
- Testimonial: your story

The first questionnaire<sup>1</sup> retrieves practices in relation to accessing the virtual classroom, reading bibliographic material, watching videos and using social networks. It is organized into two sections, one that collects personal data and the other called What do you do while you study, composed of 26 items, of which the last two questions are open-ended: What do you miss about face-to-face learning and What would you like to keep from virtual learning when you return to face-to-face classes?

The second questionnaire<sup>2</sup> collected information on students' preferences in relation to information processing. In addition, some dimensions of the Felder and Silverman (1988) model were recovered, as well as a later work by Felder (1993), where certain questions are formulated that originate dimensions on various ways of receiving and processing information. For the design of the questionnaire we considered:

- What type of information do students preferentially perceive? It was found that it can be sensory (signals, sounds or physical sensations) or intuitive (memories, ideas or badges).
- Through which senses do students perceive information? It can be visual (pictures, diagrams, flowcharts, or demonstrations) or verbal (spoken or written explanations).
- In what ways do students understand and process the content presented to them? Sequentially (step-by-step, incrementally) or globally (from a general outline).
- In what way do students prefer to organize information? It can be inductive, as from data, facts or observations general rules are inferred (from the particular to the general), or deductive, where

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<sup>1</sup> Available in:

[https://docs.google.com/forms/d/e/1FAIpQLSdJfgUnDdcUwKwqgw\\_l1YzvvnD\\_HuSQEa98bSbcohAUNj-1FQ/viewform](https://docs.google.com/forms/d/e/1FAIpQLSdJfgUnDdcUwKwqgw_l1YzvvnD_HuSQEa98bSbcohAUNj-1FQ/viewform)

<sup>2</sup> Available in:

<https://docs.google.com/forms/d/e/1FAIpQLSfILvIB9ykGziLPrhFtJsiPwMgkDkniEUG6SbrIkoetgO8woQ/viewform>

principles are presented and consequences or applications are deduced (from the general to the particular).

The design of the instrument was based on the learning styles questionnaire of Alonso, Gallego and Honey (1994), which proposes four categories: 1) visual-verbal, 2) sensitive-intuitive, 3) sequential-global, and 4) active-reflective, in addition to some dimensions of ULSM proposed by Popescu (2009):

- Perceptual modality: visual versus verbal.
- Information processing. Abstract concepts and generalizations versus concrete and practical examples, serial or holistic, active experimentation or reflective observation, careful or not with details.
- Field dependence/field independence.
- Reasoning (deductive or inductive).
- Organizing information (synthesis or analysis).
- Motivation (intrinsic or extrinsic, deep or shallow, strategic or resistant).
- Social aspects (individual or team work, introversion or extroversion, competitive or collaborative).

The information obtained in questionnaire 2 -perhaps due to the instrument's own limitations- did not allow us to identify strategies that could be precisely framed in the learning styles proposed by Alonso *et al.* (1994), nor to define preferences according to Popescu (2009). Nevertheless, it was decided to recover the information from questionnaire 2 in terms of students' self-perceived preferences.

Finally, an attempt was made to recover the students' words from their narratives. For this purpose, the study participants were asked to do the following:

Record and attach an audio of no more than three minutes in which you can tell us: what study strategies and techniques did you implement in virtuality? You could describe it from these guiding questions: what activities do you do when studying? How do you study with the virtual classroom, WhatsApp, social networks, etc.? What are your preferences? What are your strategies according to the type of resource you use to study: printed material, digital resources, videos and web pages? And, what web applications do you integrate in your study practices?



Based on the information obtained after applying the three instruments to the 70 students who made up the study, we proceeded to analyze the data as follows: 1) a global reading of the information from the three instruments was made; 2) the data of each individual subject were processed, for this purpose the three instruments applied were integrated and a synthesis per student was elaborated that allowed identifying preferences and practices of each individual; and 3) by integrating the two stages, the students were organized into broader categories that grouped them by similar aspects or recurrences.

Based on the above, three differentiated technopedagogical profiles were proposed: Gutenberg, due to the predominance of practices and preferences linked to analog technologies; Amphibian, as a result of a combination of analog and digital strategies, with a clear emphasis on the emulation of analog practices; and Maker, due to the maker culture, who were also identified as students with fundamentally digital practices and preferences, capable of recreating their didactic materials.

Thus, a model of analysis of the instruments was constructed and applied to the sample. Table 1 presents the synthesized information from each questionnaire. The triangulation of the data obtained in the three questionnaires made it possible to characterize the students surveyed in this sample according to the profiles described. The cases that evidenced a predominance of responses linked to analogical practices and preferences in the aspects surveyed in the analysis model were characterized as Gutenberg technopedagogical profiles. Students who showed a combination of analog and digital strategies, with an emphasis on digital reproduction of analog practices (such as underlining, comments or digital summaries of bibliography) were registered with the Amphibian profile. Those who expressed that they primarily deployed digital strategies and even transformed their study materials into new type resources constituted the Maker profile.

**Table 1.** Triangulation of data for the definition of technopedagogical profiles

Questionnaire 1	Questionnaire 2	Audio
The answers given in the following points were particularly considered: <ul style="list-style-type: none"> <li>• To study, do you read the materials from the screen (always, sometimes, sometimes or never)</li> <li>• To study, do you download materials? (always, sometimes or never)</li> </ul>	They were particularly considered the answers provided in the following points: <ul style="list-style-type: none"> <li>• Texts give me security, I prefer everything in writing (yes/no)</li> <li>• I need to read the lecture first or study text and then browse the other navigate the other</li> </ul>	Related aspects were surveyed with writing practices, reading, media viewing audiovisual, download and print of digital resources and patterns organization strategies study and collaboration among peers. In particular, we explored whether these

<ul style="list-style-type: none"> <li>• To study, do you print the materials? materials (always, sometimes or never)</li> <li>• When you decide and you can print, what do you print?</li> <li>• Study time for a partial in the virtual world</li> <li>• Frequency of video viewing</li> <li>• ¿ What do you do while studying?</li> <li>• Where do you feel most comfortable to participate and ask questions, in the virtual classroom or in face-to-face classroom?</li> <li>• How do you feel about participating in a synchronous synchronous meeting?</li> <li>• What do you miss about presence?</li> <li>• ¿ What would you like to keep of the virtuality when you return to face-to-face classes?</li> </ul>	<ul style="list-style-type: none"> <li>classroom resources (yes/no)</li> <li>classroom (yes/no)</li> <li>• In the virtual world, I prefer always study alone (yes/no)</li> <li>• I feel alone in the virtual world and that discourages me (yes/no).</li> </ul>	<ul style="list-style-type: none"> <li>practices involved digital technologies, analog or a combination of both, with emphasis on the reproduction of techniques analogues and in the recreation of teaching materials in new resources.</li> </ul>
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## RESULTS

The following are the results obtained from the analysis of ten students of the Education Sciences program of the Faculty of Philosophy and Humanities of the National University of Córdoba.

### On the participants

The ten students enrolled in the subject Educational Technology in the first semester of the academic year 2020 were in the fourth year of the course. The age at the time of the study was distributed in six students between 20 and 30 years old, and four over 30 years old. Eight students were working and the same proportion had no dependents. The device they used to study, in general, was the laptop computer, as well as the cell phone; in addition, they had an Internet provider for connectivity. For the most part, they considered that the devices respond to the needs demanded by the study. It is worth mentioning that eight students do not

have devices for exclusive use, that is, they share them with other members of their family.

The students who took part in the study were enrolled in a classroom course that had to adjust to the regulations of Preventive and Compulsory Social Isolation (ASPO), so the course had to adapt its proposal to the ERE modality. The course, prior to the pandemic, was characterized by a model centered on face-to-face classes that guaranteed access to the bibliography through compendiums that many students printed, with a strong emphasis on academic productions mediated by writing and the use of the virtual classroom as a repository.

In the first place, students were asked about the modality of access to the virtual classroom; six of them responded that they entered alternatively from notifications received by e-mail or from the platform (Moodle), three from the virtual learning environment, and one case from their e-mail account. Secondly, the frequency of access was revealed, where it was found that the number of logins varied: half of the students stated that they logged in daily or every other day, and the other half stated that they did so occasionally or only when they received notifications.

Regarding the frequency of printing the bibliography, the following was found: four participants stated that they printed only what they had to study, three said that they did not do so at all, two acknowledged that they only printed in the case of large volumes of text, and one student responded that he printed what he thought was important. In sum, a tendency to approach the reading of the required bibliography on paper is identified.

Regarding the consumption of videos on the platform, eight acknowledged that they only consulted them once and, in general, when they "had to study". It is relevant to highlight that, when watching the videos, nine students indicated that they stop them to take notes, instead of following them without interruptions. This is a feature that only digital resources can offer and to which they resort when studying.

In addition, the questionnaire asked about ways of viewing lectures and their recordings. Six students expressed that they consult them only if they had been absent in the synchronous meeting and three of them acknowledged that they returned to them because they found them useful for studying. About their predisposition when viewing the videos of the lectures (live or deferred), six acknowledged that they were scattered. The rest of the respondents affirmed that they felt the same way as in face-to-face; however, in another question of the questionnaire, eight students stated that they prefer face-to-face for their classes.

A question was also asked about who asked questions when they had doubts. It is suggestive that only one student approached the teacher,

while six of them chose to seek the answer to their doubts on the Internet, and three went to their classmates. Finally, we inquired about the study time in the virtual world, in case of taking an evaluation. Seven students mentioned that they required a greater investment of study time in the virtual mode, two said that it took them the same amount of hours and only one of them found it less demanding.

### About their preferences when studying

The second questionnaire allowed us to recognize some preferences in order to analyze what strategies students deploy when studying online. In the first place, there is a predilection for finding the teacher's word as a key element: the majority (nine students) recognized that they preferred to listen to the teacher before beginning to read the required bibliography. The teacher's voice, even in virtual environments, emerges as an important factor in making decisions on how to approach the didactic resources offered on the platform.

The students' preference for textual elements over other languages was identified: six of them preferred to read texts rather than watch videos and seven stated that they ignored videos when they started their journey through the virtual classroom. On the other hand, eight stated that they preferred to find resources other than textual ones and opted to study from tables, graphs and concept maps. The variety of formats and languages of didactic resources on the platform was positively valued, although with a hierarchy among them: the teacher's word emerges in the sample in first place of preference, texts in second place, and computer graphics and videos in third place.

A tendency was found in this sample with respect to deepening the conceptual scaffolding of the contents, perhaps due to the students' career profile. Even so, the majority expressed that they value examples, exercises and experience to evaluate their understanding of the theory and stated that they read the examples first before the theoretical explanation. Although in some of the responses to the questionnaire the preferences on this point seem contradictory - possibly due to the limitation of the instrument, explained below - it seems to be a group that did not have difficulties in understanding conceptual abstractions, but preferred to begin to retrace that path from the concrete and experiential as the most interesting way to learn.

In relation to the path they follow in the virtual classroom, there is an inclination to consider the activities as a guiding element to later navigate through the rest of the resources. Eight of them recognized that the exercises constituted the axis from which they oriented the exploration of the components of the class, while six expressed that each time they entered the platform they went directly to the instructions of the activity to be carried out. After the activities, the second element that organized

their paths was the syllabus; seven students stated that it was a document to which they always chose to return.

Another relevant trend that emerged from the study is the preference for generating one's own paths through the virtual classroom. Seven students stated that they felt more comfortable when they had the possibility of deciding the order of what they read, as well as the activities they performed, while six of them acknowledged that they did not always follow the same navigation pattern. In relation to this, it is considered that, beyond the inclination to hierarchize the route from the compulsory activities, the students positively valued the possibility of making decisions linked to heterogeneous paths among the contents of the subject. This option is a potential characteristic of virtual learning environments.

Regarding the social aspects of their preferences, the students showed a dominant predilection for learning with their peers: seven out of ten chose to study online together with other classmates, nine considered that they learned more when they shared activities, and the whole group believed that their peers were a good option for studying. Based on the information gathered, it can be seen that the students in this sample designed strategies for peer support during the ASPO that tended to build bridges to mitigate the lack of face-to-face meetings between peers.

### Triangulation exercise: linking practices and preferences

This study suffers from some limitations that condition the scope of the results. Because the second questionnaire presents a closed response format, it restricts the respondent's answers. Likewise, the sample conformation criteria should be adapted to certain methodological criteria that are more limited in order to favor the comparison of the data. In spite of this, it is understood that the triangulated interpretation of the information offers interesting results about each student in the sample, which facilitates the characterization of the proposed profiles.

Table 2 presents a synthesis that shows the integration of the preferences and activities of the students analyzed, and shows the diversity of preferences when studying with respect to the analog and the digital; also, the diverse strategies that each student developed as a personal practice in the face of the demands of the study are evidenced. In total, ten students and ten different study modalities are recorded, which challenge the search for their meeting points.

**Table 2.** Activities and preferences

Student	Activities and preferences
1	He or she never prints, always reads on the screen and generates a great text with everything they produce: readings, records, forums, questions, complementary contributions, and so on. He or she watches the videos once, while studying he uses his cell phone, a word processor, a browser, and hardly any virtual classroom. When in doubt, he or she consults the internet. As a group, he or she has managed to meet to read, discuss and review. What happens outside and inside the classroom, the links and dialogues, is strange from the presence
2	He or she always prints, almost never uses nets, while studying he or she performs multiple activities, including cleaning the house. In a synchronous class it feels as if it were face-to-face. Consult the program, his study method consists of marking and writing the texts; however, she or he appropriates the virtual classroom and participates in the forums. Calls for the virtuality of consultation classes, forums and recorded classes to be sustained
3	He or she resorts to textual and rarely uses videos. While studying he/she does few simultaneous activities, only uses Instagram and keeps his/her photocopies close by. In videoconference classes he/she feels dispersed and distant. he/she does not read on the screen, prints what he/she has to study and uses social networks only for what he/she needs. When in doubt, he or she consults the teacher. He or she does not review the recorded classes and does not dwell much on the videos. He or she misses his or her classmates and the university environment; likewise, he or she values the virtual classrooms that are attended.
4	No imprime, lee en la pantalla. En simultáneo, usa WhatsApp y comparte archivos, además resuelve dudas. En las clases virtuales se siente cómodo, tranquilo y comprometido con la actividad. Traslada las estrategias de lectura analógica a la pantalla. El programa es orientador de su proceso de estudio. Mantiene sus redes abiertas, el navegador (con marcadores) y el aula virtual mientras estudia. Llama la atención que no pueda estrechar vínculos con sus compañeros, aun sin conocerlos fuera del aula virtual. Le resulta difícil coordinarse para estudiar o hacer actividades con otros, se siente solo en la virtualidad y eso lo desmotiva
5	Lee en la pantalla y nunca imprime. Mientras estudia tiene abiertas otras aplicaciones y escucha música. Emplea WhatsApp con sus compañeros para intercambiar información. En la casa se distrae más que en el aula porque tiene todas las aplicaciones abiertas. Ante dudas consulta internet. Utiliza mucho las redes, toma notas en documentos de Drive y tiene todas las carpetas abiertas. Le gusta ver videos porque le resulta más fácil entender los temas. Ha utilizado software para hacer mapas conceptuales y lector de textos
6	She or he reads on the screen and never prints. While studying she or he has other apps open and listens to music. she or he uses WhatsApp with classmates to exchange information. At home she is more distracted than in the classroom because she has all the



	applications open. When in doubt, he or she consults the internet. He or she uses networks a lot, takes notes in Drive documents and has all folders open. He/she likes to watch videos because it is easier for him/her to understand the topics. he/she has used software to make concept maps and text readers.
7	He/she prefers reading on paper to make marks, records in his/her (physical) diary the activities and what he/she downloads. He/she is orderly, quite methodical. He or she uses WhatsApp and the browser a lot. He/she uses dictionary and researches through internet. He/she does not use anything else because his/her equipment is old. He/she Feels more comfortable in face-to-face class; in synchronous classes he/she is scattered. He/she reviews again the recorded classes. He/she does not feel alone in virtuality. He/she makes concept maps while studying, he/she likes to have the notes within reach. having the notes at his fingertips. Shares the device with another person
8	He or she prepares a big summary on paper with everything he or she extracts from different formats. Relies heavily on visuals, goes back to videos and looks for more material on YouTube. Watches full videos and recorded class only if absent. Uses Telegram, WhatsApp or email to bring up doubts.
9	He/she uses digital because it is his or her only option. The virtual classroom allows him or her to get organized, although he or she enters only when there is a notice. he or she prints all the material to be studied. He/she almost never uses the networks, uses few web pages. he/she drafts on paper with outlines, has a great visual memory and consults all the videos. He/she prefers the face-to-face class, since he/she feels scattered in the videoconference class. he/she uses the television to watch the videos because it is easier to pause them.
10	He/she prefers reading on paper to make marks, records in his (physical) diary the activities and what he downloads. He/she is orderly, quite methodical. He/she uses WhatsApp and the browser a lot. He/she uses dictionary and researches through the internet. He/she does not use anything else because his/her computer is old. He/she feels more comfortable in the face-to-face class; in synchronous classes he gets scattered. He/she reviews the recorded classes again. He/she does not feel alone in the virtual world. He/she makes concept maps while studying, he/she likes to have the notes at his/her fingertips. Shares the device with another person

### Common features in the sample: three organizing categories

Based on the data obtained for the unit of analysis described above, and in line with the data obtained from the overall results of the project, it is considered appropriate to propose the category "technopedagogical profile" to describe an adequate and flexible configuration of learning strategies deployed by students in virtual environments. The notion of

profile is recovered in two senses: as an outline and trait that allows the detailed description of the characteristics of a group, in addition to the meaning acquired by profiles in social networks. It is understood that the profiles in each platform (virtual environment, in the case of this study) constitute an identity mark of easy (re)configuration and customizable characteristics that fit the environment they inhabit.

In virtual environments designed for learning, students adapt their technology-mediated study strategies according to their preferences, as well as to the characteristics and demands of the educational proposal. Based on their strategies, students delineate technopedagogical profiles for learning in virtual environments. This research presents three possible general configurations which, as models, offer a first theoretical approach that allows us to recognize a typology of student practices and preferences in virtuality.

In the first place, a Gutenberg profile is identified, corresponding to students whose preferences and practices are fundamentally associated with the analogical world; they have a predilection for face-to-face presence and printed resources to link with knowledge. In virtual environments, they develop and value digital communication strategies with their peers and print as many materials as possible. These are individuals who needed more preparation time for a part-time virtual course.

For its part, the Amphibian profile refers to a hybrid type configuration in which analog strategies are likely to be preferred, although in parallel they develop some particular adaptations when inhabiting digital environments. These are study practices with technology that tend to emulate analogical strategies: they read from the screen, use highlighters and digital comments to leave their mark on the required bibliography, take notes in a word processor, and also design diagrams or diagrams that allow visual processing of information through software. These practices involve a faithful reproduction of the actions that students could recreate in person or with other tools in virtual environments.

Finally, the Maker profile corresponds to students who hack, alter or mix didactic resources -particularly their transmission medium or dwell time- in order to optimize learning or the pace of study. This involves the use of digital technology that is not easily recreated with analog tools, including the possibility of transforming a text file into an audio file to listen to the bibliography instead of reading it, obtaining the subtitles of a video to process it in text format, reproducing a class at a higher speed to make better use of time or producing "lecture documents" that present a synthesis of the totality of interactions, readings or multimedia files available in the virtual classroom; the latter case involves creating novel practices. Students are able to reconstruct their own sequence that integrates the different resources available in the virtual classroom (texts,

videos, web pages, among others); for example, the bibliography does not have value in itself but in the dialogue with other resources, recorded classes, videos, aids available for each thematic unit, among others.

## CONCLUSIONS

This article presented a theoretical framework that allowed recovering the notions of preference and learning strategies from a cognitive perspective. The methodological approach and the sample selected for the analysis were explained. The results showed the synthesis of the data found during the fieldwork through three instruments that allow an exploratory approach to the object of study in ten university students.

The digital native, millennial and Net generation notions rest on a high optimism about the advantages of early exposure to technologies by young people. This research aims to account for the study practices of ten students who were born in the 1980s and 1990s, generations that have been described as digital and hyper connected, with great possibilities of access, participation, entertainment, work and interaction from the use of the Internet (Prensky, 2001).

In addition, these young people are the result of their educational system and, in particular, of a university anchored in strongly analogical literate practices. The year of the pandemic erupted with virtuality as an order that subverts the reigning status quo in the classroom. In this context, students had to adapt their study strategies to new demands, which led them to make decisions beyond their preferences, as they tried to solve a conjunctural situation. This qualitative study attempted to capture as a photograph the particular moment described.

This has been an opportunity to observe how each student's previous trajectory, in terms of study practices, and the familiar uses of technologies are intertwined. Preferences that contradict with practices are found, as well as practices that translate preferences. A contribution of this study is the delimitation of the proposed profiles, in addition to the technopedagogical profile category, which makes it possible to describe an adequate and flexible configuration of learning strategies deployed by students in virtual environments.

The profiles can be read in a continuum from analogical to emergent practices. At one extreme, due to the obligatory nature of virtuality, many students resort to technology, although they indicate that they would not do so if they could choose; at the other, some appropriate the technological environment and explore new modalities of access and production of knowledge. These young people are possibly those who respond to the millennial profile described in various works (Díaz-Sarmiento *et al.*, 2017; Piscitelli, 2009; Prensky, 2010).

Between the former and the latter, a set of practices unfold that show the tension between what technology offers and what students need to perform or are willing to perform, based on their preferences and not only to meet educational demands. In addition, the possibility of recognizing that the forms of resolution assumed by ten students are diverse in the face of the same institutional demands is raised.

In accordance with the above, new lines of inquiry are created that will make it possible to deepen this exploratory study. It would be possible to investigate the mechanisms practiced by Gutenberg students to circumvent virtuality and maintain their analogical practices despite the technological and social environment that surrounds them. There is also a universe to be described in greater depth about the type of practices of Maker students who manage to hack - in the sense of recreating - technologies and their derivations in the construction of their knowledge, the latter framed in cultural consumption practices.

These profiles, although they are provisional categories, aim to highlight the study practices of young people and contribute to the design of educational proposals that promote and respect the heterogeneity of learning strategies and preferences.

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