



Exploration Of The Epistemological Beliefs Of Prospective Teachers On Digital Learning

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Abstract: The objective of this article is to characterize the personal epistemological beliefs of prospective primary school teachers regarding their learning experiences through specific digital tools related to their digital culture. The research is conducted in the form of a survey among a sample of prospective primary school teachers in Morocco. The results of this study indicate that the beliefs of prospective teachers vary depending on the digital tool used. Prospective teachers state that the content posted on social networks and personal blogs of trainers is understandable. They are willing to question content published on social networks, while a great number of subjects are inclined to question content published on personal blogs and institutional portals. They fully accept ideas and content published on networks and personal blogs by authors whom they consider more experienced than themselves. They also state that they rely on experts rather than trusting a consensus of respondents regarding a given content.

Keywords: epistemological beliefs, personal epistemology, digital culture, prospective teachers, teachers' training.

1. Introduction

The discourse of Moroccan educational policy is focussed on teacher training and considers this an indicator of each reform. Faced with this institutional interest, the scant existing research on education and training in Morocco appears mitigated. Indeed, analysing the reform of teacher training in Morocco, Lahchimi (2015) enumerates a number of shortcomings at various levels: quality, organization, pedagogy, management and participants (Conflict between central decision making, and that of the ministry, regions and regional academies). However, Benali et al. (2018), concentrating on the digital skills of future teachers in their initial training, affirm that searching for information on the Internet is common among the latter, whose declared practices reveal a certain facility with respect to their technical, social and informational use of ICT. In particular, in characterizing the digital culture of future Moroccan teachers in the course of primary education training, Ou-Sekou, Kaddari and Zaid (2021) show that the digital culture of prospective teachers is rooted in their personal usage of different tools and resources. Future teachers' digital practices are characterized by a frequent usage of social media and a low tendency to use institutional platforms. These observations lead us to investigate prospective teachers' epistemological beliefs regarding knowledge constructed from the digital tools employed: social media, trainers' personal blogs and institutional portals.

During the last decades, researchers have given important attention to the study of epistemological beliefs since pioneering studies by Perry (1970), Schommer (1990, 1992, 1994), and Hofer (2000, 2004) have laid an important basis in order to conceive their relations to educational practice. These perceptions have documented effects on the perceptions, practices, and behaviors of trainee teachers towards the programs they undertake, both positively and negatively (Ailincai et al., 2018). The relationship of epistemological beliefs with approaches to teaching and learning has been highly discussed (Aypay, 2010; Tanriverdi, 2012; Wanlin et al., 2019; Güneş et al., 2018). This also brought them to the forefront of issues of concern in educational setups.

In a recent study, epistemological beliefs were considered for their impact on information processing and learning in digital environments (Bråten, Brandmo, and Kammerer, 2019). Thus, it focuses more on the dynamic process of knowledge acquisition, being unfolded over the digital era. Another research is by Barzilai and Zohar (2020), who investigated how teachers' epistemological beliefs of understanding shape practice in the classroom concerning technology integration within the light of epistemological beliefs that lay importance on effort and persistence and digital literacy.

The purpose of Therriault and Harvey (2013) was to discuss epistemological beliefs and their relationship to knowledge construction in students within the setting of a reorganized training program for Quebec high school teachers who were specifying the context of their effects. However, in the area of research, Altet (2004) and Crahay et al. (2010) believe that knowledge of the epistemological beliefs of teachers is important not only to be able to manage the complexities of teaching but is intrinsic for a teacher's professional development.

While trying to find the gaps in this domain, Dimov et al. (2015) have pointed out that way more concentrated research around the teachers' and students' epistemological and pedagogical beliefs has to be done for the purpose of enhancing not only teacher training quality but also the pedagogical methods of education. Chai et al. (2006), therefore, do echo this call: the need to understand the epistemological beliefs of the prospective teachers, more so in light of the digital transformation in education.

Personal epistemology is defined by Hofer (2004) as a field of research which is interested in beliefs and also theories developed with respect to individuals' knowledge and its acquisition. According to Hofer and Pintrich (1997), personal epistemology has two major dimensions: the nature of knowledge and the nature or process of knowing. Below (**Figure 1**) is the structuring of four subdimensions of personal epistemology according to Hofer and Pintrich (1997):

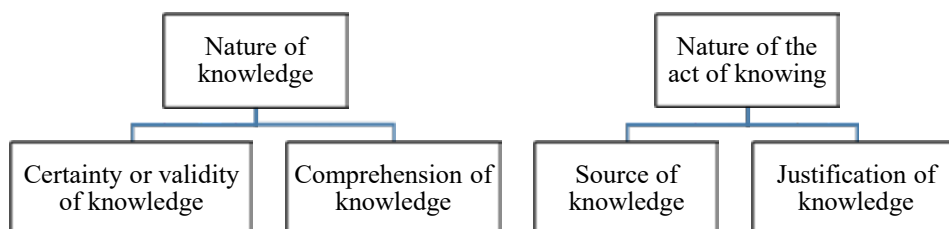


Figure 1. Hofer's and Pintrich's Model of Personal Epistemology (1997)

According to Hofer (2004), the majority of research on personal epistemology has dimensions relative to the following three questions: What is knowledge? How is it acquired? How is knowledge constructed and evaluated?

Continuing from the definition of Hofer (2004) and the dimensions determined by Hofer and Pintrich (1997), our contribution considers investigating the influence important digital instruments (social media, personal blogs, institutional portals, etc.) are having on the epistemological beliefs of future teachers. These recent findings of studies such as Ou-Sekou et al. (2021) build on, suggesting research that might look deeper into these digital settings considering how the digital settings contribute to the elaboration and judgment of knowledge but precisely treat them in how this knowledge is evaluated at the level of a digital context in accessibility and quality. Thus, two research questions are essential: What knowledge is accessible through the significant digital tools in the digital culture of prospective teachers? How is this constructed and evaluated through these digital tools?

2. Methodology

2.1. Participants

Organized as a case study, the investigation was conducted among prospective teachers of the Centre Régional d'Education et de Formation - CRMEF – Meknès (Meknès is a medium-sized city in central Morocco). The authorization to conduct the study was granted by the CRMEF. The process was completely anonymous, and no personal identifiers were used in the study.

The study participants were 56 students training to be primary teachers at the CMREF training centre. These students have degrees in various disciplines, including sciences (mathematics, physics-chemistry, biology...), social sciences and humanities (French literature, English studies, Arabic literature, history and civilization...) and economics and other social sciences. The questionnaire was administered in paper format at the CMREF to two different groups. The objectives of the research were explained to the future teachers, who were accompanied to respond to the questionnaire (The questionnaire being in French for students whose language of study was basically Arabic). The 56 future teachers of the CMREF Meknès centre included 41 women (73.2%) and 15 men (26.8%). The dominant age group was that between 26 and 30 years old (42.9%), while a minority were between 31 and 35 (12.5%). Bachelor's degrees predominated (83.9%), while 8 future teachers had obtained their masters (M) (14.3%). A single future teacher had a doctorate. The field of science and technology (ST) was dominant (41.1%), with social sciences representing 30.4% and economic and legal studies constituting 28.6%.

summarizes the future teachers' previous experience, expressed in number of months, given its minimal nature among future teachers. Most had no previous teaching experience, although a minority claimed to have considerable experience.

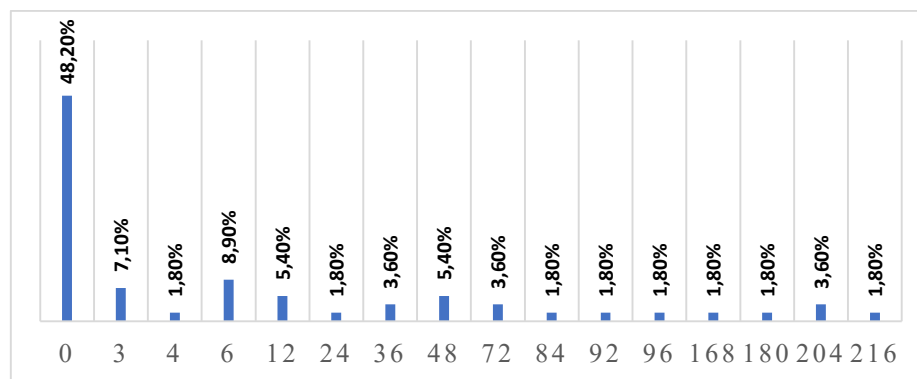


Figure 2. Previous Teaching Experience (in number of months)

2.2. Data collection instrument

Based on the model of Hofer and Pintrich (1997), a questionnaire was developed to inquire about future teachers' epistemological beliefs with regard to their learning developed through digital tools which characterize their digital culture. Questions are associated with each subdimension of the model of Hofer and Pintrich (1997). Thus, six items are chosen for the subdimension certainty of knowledge, three items for the comprehension of knowledge, six items for the subdimension the source of knowledge, and six

items for the subdimension the justification of knowledge. The responses were collected following a Likert five level scale (0: Completely disagree; 1: Disagree; 2: Neutral; 3: Agree; 4: Completely agree). The questionnaire also includes a section requesting demographic data such as sex, age, the field of study, the academic level, and whether or not the future teacher has had training in educational technologies.

To verify the reliability of the data collection instrument, we proceeded with two tests: on one hand, Cronbach's alpha coefficient was used to test the consistency of all the items of our questionnaire (20 items in total); on the other hand, indices of item-total correlation were used to verify whether an item was well chosen for each subdimension and whether it reveals a significant correlation with the total score of each subdimension. Cronbach's coefficient (**Table 1**) was superior to 0.6 for the 20 items on the four subdimensions of future teachers' personal epistemology, which demonstrates its validity according to Devellis (2003).

Cronbach's Alpha coefficient	Number of elements
.645	20

Table 1. Reliability Tests for Questions on Epistemological Beliefs

A paper version of the questionnaire was distributed, and the future teachers responded in person, considering all the questions, and eliminating any possibility of ambiguity on the proposed items. Subsequently, all the questionnaires were collected, and the data were entered into SPSS version 23.0.

3. Results

3.1. Profiles of the personal epistemology of future teachers

To describe the beliefs of future teachers regarding each subdimension, we calculated the averages of each item for all the subjects for each subdimension of the model of Hofer and Pintrich (1997). Each average calculated falls within a significant interval according to the five-point Likert scale. The tables (**Table 2**,

Table 3, **Table 4**, **Table 5**) present the relevant data obtained.

3.2. The nature of knowledge

As for the certainty of knowledge and learning, **Table 2** represents the averages of items which comprise the first subdimension: certainty of knowledge, and its significance according to the five-point Likert scale.

Items	Average item	Likert Interval	Significance
I sometimes question the ideas presented on social media*	3.98	3.40-4.19	Agree
I sometimes question the ideas presented on trainers' personal blogs.	3.34	2.60-3.69	Neutral
I sometimes question the ideas presented on institutional portals	3.21	2.60-3.69	Neutral
The content presented on social media does not contradict scientific principles	2.45	1.80-2.59	Disagree
The content presented on personal blogs does not contradict scientific principles	2.73	2.60-3.69	Neutral

Table 2. The Averages of Items from the Subdimension Certainty of knowledge for Primary Education (This table presents the items constituting the first subdimension “Certainty of knowledge” from the model of de Hofer and Pintrech (1997) and their calculated averages.).

Note. *: For this item, for example, we calculate its average for all the subjects; then, based on the Likert intervals, we can deduce the significance of the average. For this item, the epistemological beliefs are in accordance with the questioning of content published on social media.

As for the understanding of knowledge and learning,

Table 3 represents the averages of items which comprise the first subdimension: comprehension of learning and its significance according to the five-part Likert scale.

Items	Item Average	Likert Interval	Significance
The content presented on social media is difficult to understand.	2.21	1.80-2.59	Disagree
The content that the trainers publish on their personal blogs is difficult to understand.	2.54	1.80-2.59	Disagree
The content that students and future teachers publish on their personal blogs is difficult to understand.	2.36	1.80-2.59	Disagree

Table 3. The Averages of Items of the Simplicity of learning Subdimension for Primary Education (This table presents the items constituting the second subdimension “Simplicity of Learning” from the model of Hofer and Pintrech (1997) and their calculated averages).

3.2.1. The Process Linked to the Act of Knowing

Here this is a matter of characterizing the manner in which the future teachers come to know something through digital tools. As for the source of knowledge and learning, **Table 4** presents the averages of items comprising the first subdimension: the source of learning, and its significance according to Likert’s five-point scale.

Items	Item Average	Likert Interval	Significance
Sometimes I accept the content on social media even if I do not understand it	1.89	1.80-2.59	Disagree
Sometimes I accept the responses given on personal blogs (even if I do not understand them).	1.88	1.80-2.59	Disagree
The content of an article found on social media is true.	2.32	1.80-2.59	Disagree
The content of an article found on a personal blog of a trainer is true.	2.66	2.60-3.69	Neutral

I consider the content provided on a social network or a personal blog to be true even if it is in conflict with my point of view.	1.96	1.80-2.59	Disagree
I'm more certain of my learning when it is consistent with what is published on social media, on personal blogs and on institutional portals.	3.29	2.60-3.69	Neutral

Table 4. The Averages of Items of the Subdimension Source of Learning for Primary Education (This table presents the items constituting the third subdimension "Source du savoir" from the model of Hofer and Pintrech (1997) and their calculated averages.)

For the justification of knowledge and learning, **Table 5** displays the averages of items constituting the first subdimension: justification of learning, and their significance according to the according to the five-point Likert scale.

Items	Item Average	Likert Interval	Significance
What I consider learning acquired from social media and personal blogs is based on fundamental principles in each domain.	3.25	2.60-3.69	Neutral
What I consider true on social media is based on a consensus of authors, or on the opinions of experts.	2.75	2.60-3.69	Neutral
What I consider true on personal blogs is based on a consensus of authors, or on the opinions of experts.	2.79	2.60-3.69	Neutral
On social media, there are means by which one can determine whether someone is right or not.	2.63	2.60-3.69	Neutral
On personal blogs, there are means by which one can determine whether someone is right or not.	2.66	2.60-3.69	Neutral
You accept the ideas of those who are more experienced than you to evaluate what you learn from social media and personal blogs or you always refer to experts.	3.61	3.40-4.19	Agree

Table 5. The Averages of Items of the Subdimension Justification of Learning for Elementary School (This table presents items constituting the fourth subdimension “Justification of Learning” from the model of Hofer and Pintrech (1997) and their calculated averages).

3.2.2. The knowledge accessible through digital tools drawn upon by future teachers.

It is noteworthy that the questionnaire was used in person in order to remove any sort of ambiguity for each item. Thus, we explained to the future teachers that the response to a question, for example, in the form: “What I consider true on social media is based on a consensus of authors, or on the opinions of experts” on a five point Likert scale, comes back to choosing either the consensus or the opinion of an expert; and, thus, saying, for example “Disagree” for the item does not signify “Disagreeing” with the consensus and automatically validating the expert.

The certainty of knowledge and learning: In this subdimension, we are interested in verifying the extent to which future teachers consider knowledge and learning from social media and their trainers’ personal blogs, fixed or modifiable using authentic criteria (for example, fundamental scientific principles). Analysis of the averages (**Table 2**) shows that the future teachers reveal homogeneous beliefs with respect to what they learn from social media. The other beliefs with respect to learning and knowledge from trainers’ personal blogs and institutional portals are heterogeneous.

For social media, the significance of the average obtained according to the five-point Likert scale is “agree” (**Table 2**). An analysis of percentages shows that 42.86% of future teachers are in favour of questioning ideas and content published on Facebook during their studies. It is noteworthy that, regarding the content published on the trainers’ blogs, the future teachers are neutral (**Table 2**). An analysis of percentages reveals that 35.5% of future teachers are neutral in that respect, while 44.64% are in favour of questioning the content and ideas published on their trainers’ personal blogs.

As for the ideas and content published on institutional portals, the results show that the future teachers are neutral in their beliefs (**Table 2**). An analysis of percentages reveals that 44.64% of future teachers are in favour of questioning ideas and content published on institutional portals. A considerable portion of future teachers claim to be neutral in their epistemological beliefs (37.5%).

The last two items on the certainty of knowledge subdimension question future teachers as to whether or not content published on social media or on their trainers’ personal blogs contradicts the scientific principles of each field or speciality. By scientific principles, we mean all the definitions, axioms, and common rules of each field (technical sciences or social sciences). We postulate that institutional portals cannot publish content which contradicts scientific principles.

The average for this item (**Table 2**) shows beliefs confirming that the content published on social media sometimes contradicts scientific principles. In other words, the majority of future teachers (66.07%) affirm that the publications on social media contradict scientific principles at times. The same result is noted with respect to the content and ideas published on trainers’ personal blogs. 46.43% of future teachers affirm that the content and ideas published on trainers’ personal blogs may contradict scientific principles.

The comprehension of knowledge: Through the items constituting this subdimension, we attempt to determine whether or not the learning from social media, trainers’ personal blogs and institutional portals poses difficulties for future teachers in terms of comprehension. The averages calculated for the items of this subdimension show that the future teachers reveal homogeneous beliefs with respect to the simplicity of the knowledge and learning stemming from social media, trainers’ personal blogs and institutional portals (

Table 3).

The future teachers reveal homogeneous beliefs developed about the simplicity of content and ideas published on social media. The majority of future teachers (64.28%) affirm that they understand the content published on social media.

The comprehension of published content and ideas is not just restricted to social media. Indeed, the results confirm the same finding for trainers’ personal blogs. A considerable proportion of future teachers (44.64%) affirm that they understand the content and the ideas published on their trainers’ personal blogs. We note that a substantial number (46.43%) of these future teachers reveal neutral beliefs with regard to the complexity of content and ideas on their trainers’ personal blogs. The same observations extend to the content and ideas on institutional portals (

Table 3). Indeed, 50% of future teachers declare that they understand the content and ideas on institutional portals. A considerable proportion of future teachers (46.43%) claim to be neutral with respect to the complexity of content and ideas on institutional portals.

3.2.3. How is knowledge constructed through these tools?

Here, the focus is on identifying how future teachers come to know something through the digital tools employed. The items in **Table 4** aim to determine the source of future teachers' learning through social media and personal blogs. The results will be presented in response to four questions with which the corresponding items will be associated.

Do future teachers “build” their learning autonomously? The item corresponding to this question is: I am more sure of my learning when it is consistent with what is published on social media, personal blogs and on institutional portals. The average of the item on **Table 4** shows that future teachers' beliefs are heterogeneous, which is confirmed by an analysis of percentages. The dominant beliefs expressed are completely consistent with the existence of learning developed autonomously by the future teachers.

Are social media and trainers' personal blogs external authorities which transmit learning to them?

Here, we consider that institutional portals are purported to constitute an official authority for the transmission of learning. The objective of this question is to verify whether the learning offered by social media and trainers' personal blogs is external and transmitted with a degree of certainty to future teachers. We associate two items with this question: The content of an article found on social media is true and the content of an article found on trainers' personal blogs is true. The average for the two items (**Table 4**) reveals homogeneous beliefs (expressing a majority position) regarding the networks and heterogeneous beliefs (not displaying a majority position) regarding trainers' personal blogs. For social media, the dominant beliefs of future teachers (66.07%) show that they do not consider social media as an external authority for the transmission of learning. For trainers' personal blogs, an analysis of frequencies reveals heterogeneous beliefs. 51.78% of future teachers do not consider the personal blogs of their trainers an external authority for the transmission of learning.

Do future teachers manage to construct learning through interactions with others on social media and via the personal blogs of their trainers? The digital tools of social media (WhatsApp, Facebook, Instagram...) and trainers' personal blogs all offer functionalities of synchronous or asynchronous interactions. The focus of this question is to determine whether the future teachers construct learning through interactions with others on social media and their trainers' personal blogs. The item associated with this question is: I consider the content provided on social media or on personal blogs as true, even if it is in conflict with my own perspective. The future teachers have homogeneous beliefs. The analysis of frequencies shows that the majority of future teachers (75%) reject the role of interactions with others on social media and on personal blogs in the construction of their learning.

Are future teachers capable of constructing the meaning of learning stemming from social media and personal blogs?

This question aims to determine whether future teachers develop meaning from learning stemming from social media and personal blogs. This question is related to two items: Sometimes I accept the content on social media even if I do not understand it, and sometimes I accept the answers provided on personal blogs (even if I do not understand them). The averages in **Table 4** show that future teachers' beliefs are homogeneous. Analysis of the percentages reveals that the majority of future teachers (80.36%) do not accept learning stemming from social media without understanding the meaning. The same finding is also confirmed with respect to trainers' personal blogs. The average of **Table 4** displays homogeneous beliefs. An analysis of percentages reveals that the majority of future teachers (80.36%) disagree wholeheartedly with accepting learning from their trainers' personal blogs if they fail to understand it.

3.2.4. How is knowledge evaluated via these tools?

The objective of this section is to identify how future teachers justify and evaluate learning from social media and their trainers' personal blogs. We hypothesize that learning from institutional portals is purported to constitute the norm and does not require any particular evaluation. The items which comprise this subdimension are listed in **Table 5**. In this subdimension we have asked the future teachers about the role of their personal experience, as well as that of the experience of others, in their beliefs. We have also inquired about the influence of the consensus of others and of experts on these future teachers' epistemological beliefs. Consequently, two questions were formulated: To what do future teachers refer to evaluate the learning and knowledge stemming from social media and their trainers' personal blogs? What is the role of the expert in future teachers' beliefs faced with experience, and with the consensus of respondents on something published on social media and on their trainers' personal blogs? Again, to answer these questions, we associate with each question the corresponding items from **Table 5**.

To what do future teachers refer to evaluate the learning from social media and their trainers' personal blogs? To respond to this question, we have examined the role of each field's fundamental scientific principles in the process of evaluating learning and knowledge from social media and their trainers' personal blogs. The possible existence of other means, besides the fundamental scientific principles of each field, allowing for intervention in this process was also examined. Three items are associated with this: What I consider learning stemming from social media and personal blogs is based on fundamental principles of each field; On social media, there are means of determining whether an individual is right or not; and on trainers' personal blogs, there are means by which one can determine whether an individual is right or not. The averages calculated for the three items show that future teachers' beliefs are heterogeneous (**Table 5**). An analysis of percentages for each item allows us to describe future teachers' beliefs.

With regard to the fundamental scientific principles of each domain, the future teachers reveal heterogeneous beliefs. Indeed, the majority of future teachers (53.57%) affirm that they always verify that the learning and knowledge stemming from social media and personal blogs respect the fundamental scientific principles of each field.

We also questioned the future teachers as to whether they subject the learning and knowledge stemming from social media and personal blogs to other criteria than fundamental scientific principles for purposes of evaluation. For social media, future teachers' beliefs are heterogeneous. The dominant beliefs among future teachers (51.78%) tend to deny the existence of means to evaluate the learning and knowledge stemming from social media. The same finding was confirmed for trainers' personal blogs. Future teachers claim heterogeneous beliefs. Their dominant beliefs (48.21%) tend to also deny the existence of means to evaluate the learning and knowledge stemming from their trainers' personal blogs.

What is the role of the expert in the beliefs of future teachers faced with the respondents' experience and consensus on learning published on social media and on their trainers' personal blogs? This question seeks to determine whether future teachers rely on consensus, an expert or experience to evaluate the learning from social media and their trainers' personal blogs. In accepting that experts in each field are authorized to evaluate learning in their speciality, we examine the tendency of future teachers' beliefs when they must choose between the opinion of the expert and the consensus of others, and between the expert and another individual who is more experienced in a particular field.

The averages calculated for the items concerning the role of the expert given a consensus of respondents regarding learning or knowledge published on social media and on trainers' personal blogs displays witness to heterogeneous beliefs (**Table 5**). An analysis of percentages shows that 55.36% of future teachers turn to the expert, versus 39.29% relying on the consensus to evaluate the learning from social media.

The same observation for social media is confirmed for the trainers' personal blogs. Analysis of the percentages shows that 50% of future teachers turn to experts to evaluate the learning from their trainers' personal blogs, compared to 41.07% who believe in the consensus of respondents on these personal blogs. The average of the item on the role of the expert compared to experience shows homogeneous beliefs for the future teachers (**Table 5**). Analysis of percentages reveals that 73.21% of future teachers prefer to refer to a more experienced individual to evaluate the learning from social media and personal blogs rather than taking an expert's opinion into account.

4. Discussion

In this article, we show that the epistemological beliefs of future teachers vary depending on the digital tools utilized. This heterogeneity of epistemological beliefs with respect to digital tools is confirmed by the results of Szeto et al., (2016), showing that researchers noticed a positive but different attitude among future teachers towards the usage of digital tools in teaching English. This is also consistent with the results of Ertmer et al. (2015) and Sang et al. (2010) who demonstrated a potential relationship between future teachers' epistemological beliefs and the integration of technologies in their future teaching. Given that each digital tool is characterized by its own digital environment and its own services/resources offered to the user of this environment, it seems that future teachers' varied choices of digital tools lead to different learning processes for each digital tool.

This paper also reveals future teachers' homogeneous epistemological beliefs regarding the comprehension of content published on social media and on personal blogs. Future teachers declare that the content published on social media and on personal blogs is simple and accessible. These results are in line with those of Szeto et al. (2016) and Lau (2018), whose results show that future teachers find the content published on social media simple and easy to integrate into their future pedagogy.

For future teachers, the learning acquired via social media, their trainers' personal blogs and institutional portals is not "absolute" and is liable to be called into question. The results show that most of them are in favour of questioning content published on social media, on personal blogs and on institutional portals. This uncertainty about the publications on social media is corroborated by Olson, Clough & Penning (2009a) who conclude that 56% of the publications on social media by those in initial training to teach elementary school were inappropriate. Ultimately, the results confirm those of Biberman-Shalev (2018) who led a study on the contribution of personal blogs and common blogs to the professional development of students in teacher training. The author concluded that the majority of future teachers declare positive tendencies with respect to the content published on personal blogs. Future teachers draw upon fundamental principles of science to test the nature of their learning. They affirm that the content published on networks and their trainers' personal blogs sometimes contradicts fundamental scientific principles.

Two other results are worthy of mention, with respect to the nature of future teachers' search for knowledge via digital tools: social media and personal blogs. The first result concerns the construction of learning: whether it is autonomous, produced as a result of incitement by an external authority (social media and personal blogs) or via interactions with other users of social media and personal blogs. The second result is related to future teachers' construction of the meaning of what they have learned. The autonomous construction of learning by future teachers may be interpreted as the product of their experience in the usage of technologies, which develops their self-determination and the exploration of their identity (Rebah & Debov, 2017). In this sense, the future teachers declare that they are constructing autonomous learning provided that it is consistent with what is published on social media and on blogs. This finding also demonstrates that social media and blogs can be seen as authorities influencing the construction of learning by future teachers. Nevertheless, this affirmation is tempered by the fact that future teachers are not sure whether the content published on social media and on personal blogs is true. They declare that they do not trust interactions with peers to develop their learning or to verify the truth. Moreover, other research stresses the limited role of interactions in the construction of learning in that they remain influenced by epistemological beliefs (Noroozi, McAlister and Mulder, 2016) or by the nature of the published content, favouring independence instead (Borup, 2016). Future teachers claim to refuse all sorts of learning published on social media and on their trainers' personal blogs if they do not manage to understand it.

To validate the knowledge acquired on social media and on personal blogs, the majority of future teachers claim to refer to fundamental principles of each field to determine whether the publications respect them or not. This result shows that future teachers construct their knowledge in basing it on scientific evidence, and this corroborates the results of Brownlee, Purdie and Boulton-Lewis (2001) who show that, of the 29 prospective Australian teachers in their study, 62% believe that knowledge is constructed individually on the basis of scientific evidence.

Our results show that the future teachers accept the ideas and the content published on the networks and on personal blogs by those who are more experienced, rather than referring to an expert on these tools. This important impact of others' experience on their own beliefs is not confirmed by Chai et al. (2006), who show that future teachers believe in the evaluation of experts during the acquisition of new knowledge. The impact of the expert on future teachers' beliefs changes when they are faced with a consensus on a certain subject. They claim to turn to experts rather than having faith in the consensus of authors on this subject.

5. Conclusion

This article seeks to characterize the epistemological beliefs of future teachers relative to knowledge developed through digital tools. The results show that future teachers' epistemological beliefs vary depending on the digital tool employed, which leads to different learning processes for each digital tool. Specifically, in relation to the four subdimensions of personal epistemology, four observations may be formulated. First, the future teachers question the content and ideas published on social media, their trainers' personal blogs and on institutional portals. They affirm that the content published on social media and on their trainers' personal blogs is not always consistent with the scientific principles of each domain. Secondly, future teachers affirm that the content published on social media and on personal blogs is simple and accessible (in terms of comprehension). Thirdly, future teachers contribute effectively to the development of their learning from social media and their trainers' personal blogs. They refuse to consider social media and their trainers' personal blogs as authorities in terms of learning; they claim that discussions with others through social media and trainers' personal blogs do not contribute to the development of their learning. The future teachers add that they do not accept incomprehensible content from these social media and trainers' personal blogs. These findings confirm future teachers' autonomous construction of learning. Fourthly, the majority of future teachers claim to refer to fundamental scientific

principles to evaluate their learning from social media and their trainers' personal blogs. The majority of future teachers are unaware of the existence of other criteria to evaluate their learning. The expert is valued in future teachers' epistemological beliefs. The majority prefer to refer to experts rather than to have faith in the consensus of respondents on social media and on trainers' personal blogs. They also claim to take into consideration the opinion of those more experienced, rather than their personal experience and of that of experts. The autonomy observed in the responses of future teachers is obtained at the price of an "experimental" development of knowledge, by trial and error, through verification by way of other digital resources. The cognitive judgement of future teachers, developed with the help of digital tools, seems to be empirical.

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