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## **A developmental research-based teacher education: designing and implementing a new program for preservice teachers in France**

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## **Introduction**

This article is both theoretical and illustrative. Based on the limitations of the main approaches about research-based teacher education, it aims to conceptualize an alternative research-based training approach and to exemplify its implementation in French teacher education.

Improving the quality of teacher education is one of the major priorities of educational policy in Europe (OECD, 2018). The aim is to provide more effective support to Preservice Teachers (PTs) as they enter an ever more complex profession. In most countries, preservice teacher education is based on an alternative periods dedicated to courses at university and teaching practice in schools. One of the greatest challenges of this system is to effectively reinforce the university-school partnership in order to build curricular consistency and to contribute to the development of PTs’ professional skills (Lamb & Jacobs, 2009; Zeichner, 2014). However, this reconciliation is not always successful. Several studies have highlighted the lack of collaboration between University Supervisors (USs) and Cooperative Teachers (CTs) (Elstad, 2010; Portelance, Caron & Martineau, 2016), as well as the PTs’ difficulties in referring what they experience in classroom to theoretical content studied at university (Darling-Hammond, 2006; Korthagen, Loughran & Russel, 2006). Considered as a “practice

shock” (Korthagen, 2010), this disconnection needs to be tackled in relation to the European political will to elevate the teacher training programs to Master’s degree status (Munthe & Rogne, 2015). Among the solutions considered for raising the professional training to the rank of Master and avoiding the break between content knowledge and teaching experiences with classrooms, grounding teacher education in research is a frequently expressed strategy of national education policies (Alvunger & Wahlström, 2018; Cheng, Cheng & Tang, 2010; Tryggvason, 2009).

Currently, teacher training programs involve a variety of approaches to research-based teacher education (Burn & Mutton, 2015; Eklund, 2019). In some programs, research-based teacher education is primarily focused on familiarizing PTs with the latest scientific research in specific fields (for example, how to further engage pupils to learn). This so-called “scientific” research-based approach is the most frequently encountered in northern European nations (Krokkfors et al., 2011). For example, Munthe and Rogne (2015) investigated the meaning of such research-based teacher education in an interview study in Norway. PTs report that they needed to be trained in research methods and research literature about teaching strategies in order to apply them in their own project. Nonetheless, this way of considering the link between research and teaching practice has met a certain amount of criticism. One of the main obstacles refers to the universal and the prescriptive status of scientific knowledge. This instrumental relation with theoretical bases prevent PTs from using knowledge in a contextualized way and with a critical eye (Eklund, 2014; Hammersley, 2005). While the appropriation of scientific knowledge about teaching and learning may help PTs to frame and understand their professional practices differently, it remains divorced from the context in which PTs actually work. Furthermore, this does not help novice teachers to build functional tools for the day-to-day realities of the teaching profession (Jakhelln et al., 2021).

In other systems, research-based teacher education is not so much about ensuring that PTs are acquainted with the latest academic research, but more a matter of inquiring about their professional practice (Cassidy et al., 2008). In this more “professional” research-based approach, the research materials used are treated as supportive, helping to create training modules in which PTs understand practical teaching situations with reference to their own experiences and the experiences of pupils (Sachs, 2016). Studies have described positive consequences for PTs engaging with this practice-oriented approach, promoting a sense of agency and commitment to change (Colucci-Gray et al., 2013; McIntyre, 2005). By learning to engage in action-research, PTs will develop analytical capabilities that will help them to cope with professional challenges encountered in classrooms (Sachs, 2016). However, Darling-Hammond (2017) has also stressed that, when teaching practices are subjected to investigation, PTs generally tend to question their own lesson plans without seeking to analyze the deeper relationship between teaching practices and pupils’ learning experiences. Moreover, when questions emerge from their teaching experiences, PTs often feel insufficiently supported to make links between theoretical knowledge and issues emerging from field realities (Korthagen, 2017; Waeye & Haugaløkken, 2013). This approach of research-based teacher education is nevertheless favored by French policies. According to the French Ministry of Higher Education, introduction to research is useful for professional development on the condition that knowledge is anchored within the realities and diversity of field situations (Rayou & Ria, 2009). However, according to considerable heterogeneity in the content of the teacher training programs (Auduc, 2012), the reciprocal links between scientific knowledge and teaching practice are not declared.

Anchored in a “scientific” or “more “professional” approach, the research-based teacher education has flaws in terms of links between theoretical object (theory *versus* practice) and the spaces for training (university *versus* schools). Trying to overtake the

limitations of the previous approaches, this article aims to conceptualize and illustrate a more “developmental” research-based teacher education, considered as an opportunistic perspective (Hennessy, 2014). The opportunity of development comes from difficulties professionally experienced that need to be interpreted by linking practice to theory. Placed in a lifelong learning perspective, this alternative approach is focused on the relationship between the university courses and the grassroots experiences supported by the bridge of the training program that may contribute to building professional skills in a sustainable professional way.

In the first section, we present the theoretical principles of a developmental research-based approach to teacher education scaffolded by a sociocultural view of professional development (e.g., Bruner, 1990; Vygotsky, 1934/1986). In the second section, these principles are illustrated by an empirical study conducted in the specific context of preservice teacher education in France. The final section is oriented toward the necessary conditions for, and the main obstacles to, the implementation of the training program strengthening a reciprocal link between theory and practice.

### **1. A developmental research-based teacher education**

Our approach to professionalization is informed by theoretical reflections on the relationship between culture and human development (e.g., Bruner, 1990; Vygotsky, 1934/1986). A developmental research-based teacher education can be defined as a social-cultural approach embedded in teaching practices and in a lifelong learning path. According to this approach, a developmental research-based teacher education focuses more specifically on the processes of learning new knowledge and their influence on the development of new capacities in order to think about the contextualized practical experience and to act differently in a teaching situation. In other words, a developmental research-based teacher education is grounded on the links between learning and the development of the activity (Vygotsky, 1934/1986). These links emerge from new cultural signs acquired in collaboration with more

knowledgeable individuals and from the co-construction of new actions anchored in contextualized teaching situations. This approach implies a collective dimension, with learners working as part of a community of peers and trainers (USs and CTs), committing PTs to a process aiming to comprehend and interpret their teaching practices. The process is conceptualized as iterative cycles founded upon three core principles which are described in greater detail hereunder: (i) analyzing the practical difficulties and defining the shared professional problems, (ii) co-constructing professional solutions to be tested, (iii) experimenting with professional solutions and evaluating their pertinence for both teachers and pupils.

### ***1.1. Step 1: Analyzing the practical difficulties and defining the shared professional problems***

Inviting PTs to “do research” in an academic context often leads them away from their own classroom practices. The aim of developmental research-based teacher education is precisely to ensure that research remains firmly rooted in the context of the actual problems experienced by PTs. In respect with this embedded conception of teacher education (Korthagen, 2010), training based on developmental research seeks to support PTs as they define the professional difficulties they encounter (Chaliès et al., 2010). To support PTs in analyzing these difficulties, linking practice to theory and research methodology could be relevant. On the one hand, research tools – particularly post-practice interviews (self-confrontation interviews, for example), may help PTs to put into words their practical experiences and to become aware of what has not worked, or not worked entirely during their lessons. On the other hand, being acculturated by the trainers to theoretical frameworks and key concepts in the education field can help PTs to interpret their difficulties more accurately and to understand the motives that prompted them to act (Escalié & Chaliès, 2016). Building in this analytical framing, developmental research-based teacher education involves PTs using

theoretical concepts and methodological tools in connection with their practice context to define a research object. This is an important aspect of our approach, setting it aside from a more pragmatic research-based approach which prioritizes immediate solutions. Then, the USs encourage PTs to discuss among themselves the difficulties they encounter, a framing exercise whereby personal difficulties are collectively transformed into shared professional problems. Discussions among peers can also help to identify the factors at the root of common difficulties (for example, unsuitable class formats, interactional designs ill-suited for learning, or a configuration of tasks that is ill-matched with the pupils' zone of proximal development). By engaging with this new approach focused upon real difficulties encountered in the classroom, PTs develop professional skills understanding how to analyze learning situations and how to identify shared problems.

### ***1.2. Step 2: Co-constructing professional solutions to be tested***

In accordance with the social-cultural understanding of professional development (Brown & Duguid, 1991), the transformation in practice happens when a person actively involved in the community changes the understanding of his/her professional practice through his/her multiple participations (Rogoff, Matusov & White, 1996). That's why, in a developmental research-based approach to teacher education, particular emphasis is placed on the opportunity PTs have to collectively co-construct new professional solutions in response to shared problems.

This collective construction of solutions is made possible by comparing and discussing different points of view, backed up with scientific knowledge (key concepts, theoretical postulates, and empirical results) acquired under the USs supervision. Working with the scientific knowledge developed by previous research, the PTs are supported to identify concrete actions which will help them to adapt their teaching strategies in the classroom context. The collective dynamic of the trainee teachers is aided and abetted by the collective

contribution of the CTs and USs involved in the training program, helping them to select the most relevant solutions to be tested given the specificities of their teaching context. The latter may feel the need to challenge the professional validity of some of the solutions constructed by the PTs. In this matter, a training model based on developmental research requires “collective engagement” which takes concrete form in the judgment expressed by USs and CTs on the pertinence of the solutions proposed by PTs with regard to their teaching contexts. Our approach diverges from models of research-based teacher education focused on familiarizing PTs with scientific knowledge prescriptively presented. The aim of our approach does not require PTs to implement pre-constructed systems whose validity is yet to be confirmed (Tynjälä, 2008). Instead, our approach helps PTs to construct solutions tailored to the classroom environment, taking inspiration from analysis and educational proposals found in the academic literature.

### ***1.3. Step 3: Experimenting with professional solutions and evaluating their pertinence for both teachers and pupils***

It could be advanced that one of the major risks of research-based training would be the difficulty for PTs to assess the effects of experiments put into practice in the classroom. In this matter, the challenge facing the developmental research-based teacher education is to support PTs with the experimental transformation of their professional practices. In order to stimulate their understanding and objectify the validity of the transformation, the research tools are used to report on the influence of professional solutions on both PTs development and pupils’ learning experience. This means encouraging PTs to make rigorous use of research tools such as observation logs, audio-visual records of classroom activities, and even interviews with pupils in order to gather their perspectives on the learning experience. Interviews, as well as self-confrontation interviews conducted with pupils (Moussay & Flavier, 2014) are useful “filters” when it comes to understanding the outcomes of



experimentation (Hedges, 2012). During self-confrontation interviews, the meaning each pupil attributes to his/her actions can serve to reveal or confirm signs of new learnings or new obstacles arising from experimentation with professional solutions led by the PTs. Furthermore, our developmental research-based approach to teacher education encourages PTs to analyze the data they gather in order to identify what has changed in their work, and how it contributes to their professional satisfaction (Authors, 2018). Adopting an iterative approach to developmental research (Farley-Ripple et al., 2018), the exercise of processing the data encourages the PTs to think more deeply about the learning experiences they inspire in their pupils, as well as the potential difficulties which might arise from their new solutions. Practices can then be adjusted in response to these analysis, and the material accumulated can be analyzed by the PT community, then used to shape and fine-tune future experiments.

Through these steps, a developmental research-based teacher education highlights the interest of bridging the analysis of practical difficulties using research tools and scientific knowledge and the analysis of the transformations generated by the experience. The bridge illustrates the reciprocal link between scientific content and in-class practice, offering the opportunity for PTs to develop professional competencies based on a clear identification of efficient actions in the real context of the classroom.

## **2. Implementing a developmental research-based teacher education in a French training program**

The empirical data presented hereunder are taken from a qualitative study whose primary objective was to describe the work of a group of PTs guided by the US in a training module designed with reference to the developmental research-based approach to teacher education detailed above. These data serve to illustrate some of the principal dilemmas encountered when a developmental research-based teacher education was used within the

teacher education environment. They also serve to situate the professional skills at stake for PTs, and the nature of the work done by USs to foster their development.

### ***2.1. Methodological context of the study***

In France, PTs are registered in a specific Master, in an institution specialized in teacher's training. In order to become a teacher at the end of their Master, PTs must succeed and get a national diploma including written and oral tests. For the duration of their Master, PTs are therefore oriented toward the preparation of the national exam (which will be taken at the end of the second year), and toward the professional training of becoming a teacher. To achieve this goal, PTs will need to be present two days per week in a school where they will be accompanied by a CT. The research training is realized in the institution. PTs will then use their professional practice at school to feed their training at the institution.

The approach studied here is implemented each year within one of the teaching modules which make up the Master's program for physical education teachers at the University of Toulouse (France). The training itself is on a long-term basis. Spanning a total of 100 hours of teaching for the PTs, the approach is implemented in successive stages over the four semesters of the Master's program. During the first semester of their first year of Master's, the PTs define a professional difficulty and work together to build potential solutions. They manage to build an experimental device before the end of the first year of Master's. Then, they put this device into practice during a « training » session, which gives them the opportunity to learn how to utilize research tools to collect and analyze data. Based on the obtained results, PTs will optimize their experimental device the following year. Finally, they will implement it during the third year of their Master's. The last semester will be dedicated to analyzing the data collected to build their results and to discuss them. Therefore, the training lasts two-year. It is from this context that we situate ourselves in a developmental research-based approach teacher education.

The PTs enrolled in this training were between 23 and 25 years old. At the end of their first year of the Master's, they take the national competitive exam that qualifies them to teach in France's middle schools (11 to 15 years old). Most of the training provided in the first year of the master's degree takes place at the university. However, PTs are placed in a school one day a week for a professional practice internship. This internship takes place in the classroom of a CT. The training offered in the second year of the Master's degree is carried out on a work-study basis. Three days per week, PTs are placed in school and are in charge of their own classes.

In this study, we worked with 10 PTs and one US who were all volunteers. Data were collected during all research training sequences conducted at the university and during professional practice sequences in schools. PTs selected the sequences at school considered as significant, according to their research work. During each sequence, audio and video recording data were collected with the camera and an RF microphone. These were the 'extrinsic data' to be further processed for the self-confrontation interviews, in which the 'intrinsic data' would be collected. During these interviews lasting from 30 to 40 minutes, the participants were invited to analyze their activity and critically reflect on it. During these self-confrontation interviews, the researcher's objective was to access the meaning of the participant's activity 'by being instructed' by him/her (Escalié & Chaliès, 2016). According to Vygotsky's theoretical framework, the objective of the self-confrontation is to help the actor to develop the meaning of the actions from what he sees himself doing, what there is to do, what and why he would like to do, what he could have done and what would have to be done again. The capacity of consciousness to make these links between these actions, the comings and goings of thought towards the word, and from the word towards the thought appear essential to overcome the expression of concerns and conflicts (Vygotsky, 1934/1986).

After transcribing all the self-confrontation data, the corpus was broken down into

units of analysis, related to the study object and according to Leontyev's theoretical framework (Leontyev, 1984). These units were defined thanks to the description of an action, which was associated with a motive [Do this or do that... because, in order to]. For some actions, it was possible to identify operations [by doing this]. The analysis process identified statements of concerns, conflicts, and activity (motive), actions (goal), operations (conditions) (Leontyev 1984). Four researchers independently analyzed data and the interpretations were then discussed among the researchers until an agreement was reached (Lincoln & Guba 1985).

## ***2.2. Empirical illustrations***

### *2.2.1. Constructing of research objects: (re)incarnating classroom practices in order to better (de)situate them*

Working to ensure that the objects of PTs' research are directly connected to real teaching challenges requires the US to adopt a unique approach. The outlines of this approach are investigated hereunder. The following extract is taken from a training session held early on in the program (Master 1 – October). During this session, the US uses the audio-video recording of a teaching exercise conducted by a PT to introduce, “live” in front of the rest of the group, an “*interview technique*” which will be used in their research (Extract 1).

#### Extract 1 – Training session

US: You look bored. Maybe I'm wrong, but perhaps we could stop and look at this specific moment more thoroughly?

PT: Yes, they (the pupils) are not doing exactly what I asked them to do... but it's not like it's not interesting.

US: So for you this is a classroom episode which would be worth discussing?

PT: Yes.

US: So you see (the US addresses the group of PTs), what we re-enacted there was basically the start of the interview exercise. I worked with him to identify the episode which posed a problem. Now that we've identified the episode we want to study, we can get stuck in. From your perspective, can you help us to better precisely understand what difficulty you encountered here? What bugs you, and what prompts you to say that this was a difficult moment?

PT: In this case it's mainly the fact that I didn't get what I wanted... and at the same time, I realize that you can't always force them.

In this example, the US chooses a PT and “*simulates*” an interview technique which he wants to “*introduce*” to the other PTs in the group so that they can then “*apply it amongst themselves.*” This is confirmed in the following extract from the self-confrontation interview conducted with the US by a researcher (Extract 2).

Extract 2 – Self-confrontation interview with the US

US: At this moment, I’m simulating what I want them to do afterwards. Right there I’m demonstrating the research interview technique.

CH: You’re teaching it?

US: That’s it. They then have to apply it... amongst themselves.

CH: Is this a research technique?

US: Yes, but I’ve actually given it a twist, I’m using the research tool to help them construct their own research objects.

CH: What do you mean by that?

US: For me, their object should correspond to their experiences in the classroom.

CH: Yes.

US: But, if you just ask them, they are not able to describe their difficulties. The goal is to use this technique to help them reflect on their work, and then identify the difficulties... the actual difficulties they have experienced.

CH: So you’re demonstrating this technique to help them define their own research objects?

US: It’s a start.... But then, I also have to define those difficulties, otherwise the risk is that they will be too concrete... they won’t be suitable for analysis as research objects because they are too rooted in their context.”

This extract illustrates two major points regarding the US’s activity in this training system. The first concerns the particular use of the research tools. At this early stage in the course, the US “*puts a twist*” on one of these tools so that PTs might use it to “*reflect on their work*” and “*identify the actual difficulties they have experienced.*” In other words, the US is preoccupied with learning PTs to describe their difficulties. He makes creative use of the research tool (goal) in order to help PTs with the construction of a particular professional skill (motive). The skill in question relates to their awareness of the difficulties encountered in the classroom, an important step towards identifying pertinent solutions. The second point is the involvement of the US in this process of construction, based on concrete difficulties encountered by the PTs, professional problems which subsequently become objects of research. The US expresses a conflict between two actions: “*helping the PTS to identify the difficulties*” or “*defining himself the difficulties, otherwise the risk is that the problems*

*defined by the PTs will be too concrete*". He draws attention to the paradoxical nature of the support provided, which consists of rooting research objects in the PTs' professional experiences, while also striving to de-situate and dis-embodify these experiences (goal) in order to allow for theoretical research work (motive).

### *2.2.2. Seeking collective solutions to professional problems while also creating the conditions for individual professional transformations*

Helping the PTs to define the contours of their shared professional problems, the US asks them to conduct a review of the existing academic literature on these problems (goal), in order to identify potential solutions (motive). This process of research, reading, summarizing and analyzing is conducted in small groups (condition), which helps PTs to develop professional skills related to collaboration and the co-construction of transformations applicable in the classroom. This is confirmed by the US when he asked to comment on a specific training session (Master 1 – January), devoted to a "*progress report*" with regard to academic literature review (Extract 3).

#### Extract 3 – Self-confrontation interview with the US

US: So here, we're checking on the progress of their research... In groups, they were asked to find and analyze a number of articles to help them create their solutions... With reference to their group problems.

CH: So they're giving an account of their reading?

US: That's it. And I check that they've been using the research technique I showed them.

CH: And what about the construction of solutions you were talking about?

US: That's in the learning materials... It's something I asked them to fill in... They're reading here, but they're also looking to put that reading into practice... in a professional sense, to find solutions.

CH: So these are group solutions?

US: For groups of problems, yes. Which is slightly complicated afterwards because we then move on to individual experimentation.

CH: Complicated, yes...

US: Because there's work to be done before moving onto your own experimentation... in the classroom. Everyone needs to test their findings with their class.

This extract highlights some of the skills associated with research activities and honed here by the PTs, in the interest of their professional development. The US has equipped the PTs (goal) to "*find and analyze a certain number of academic articles*" (motive), but

primarily with the concern of finding solutions that will form the basis of their “*experimentation in the classroom*” (motive). The document that they are supposed to fill in does not simply demand an account of their reading; it is also designed to enable the US to assess the capacity of the PTs to construct “*professional solutions*” (motive). This extract also serves to highlight the complications engendered by the fact that PTs are asked to work collectively, whereas the ultimate goal of the exercise is to transform their individual classroom performances. This aspect of the problem was explicitly addressed by one PT when he was asked to review and comment upon this same episode (Extract 4).

Extract 4 – Self-confrontation interview with a PT

PT: In my opinion, that document is good but it’s not specific enough.

CH: Specific in what sense?

PT: In terms of the solutions, it’s fine ... we developed them together, but then everybody needs to appropriate them individually... with their class. I know that we did speak about it, but when I look at my own experience I feel like it wasn’t a success, because I was still thinking about what we came up with together (with the other PTs). I didn’t push it further... It wasn’t specific enough.

In this extract, consistent with his own particular teaching experience, a PT describes the conflict, resulting in making the transition from collectively-constructed solutions for generic professional problems with specific solutions. Much like the US, he highlights the delicate process of transferring the lessons learned from collectively constructing professional solutions based on academic reading into the individual educational arena, bringing singular professional transformations. Perhaps lacking sufficient support in the construction of this skill, the PT’s experience proved to be insufficiently specific, and thus failed to objectify the desired professional outcomes.

*2.2.3. Conducting rigorous scientific experiments... with professional objectives*

The US helped the PTs to conduct their own research work in the classroom. Some of the PTs adopted a qualitative approach to this experimentation (goal), making audio and video recordings and then using this data to conduct semi-directive interviews with some students from the class (condition), or even asking a peer to interview them (condition). Others

adopted a quantitative approach (goal), gathering data using questionnaires and observation tables in order to detect transformations in their pupils (condition). Whatever methodological approach they chose, this research project served to foster the PTs' professional development. Nevertheless, the precise nature of this development remains unpredictable considering the difficulties encountered in attempting to reconcile the specific demands of research practices, on the one hand, and professional realities, on the other. The following extract, taken from a subsequent module (Master 2 – December), illustrates the difficulties experienced by both the US and the PTs (Extract 5).

Extract 5 - Training session

US: Careful, this is a problem I've already talked about... it needs to be doable, in the classroom... I can hear some of you saying 'we'll do this or that' but I can't see how it would be physically possible... For example, you can't ask your control group to just do nothing. Mathilde (a PT) you were saying, 'I won't say anything to these pupils,' but that's just not possible... in the classroom.

PTs: Yes but if we want to compare...

US: If you want to compare, you need to compare two groups who have both had the benefit of your experiment... Or else, you don't compare and you focus instead on ascertaining what the consequences are for different types of students.

Asked to review and comment on this extract, the US informed the researcher that this was a "grey area." He explained that he was obliged to uphold a certain academic standard with regard to research work (goal), while also striving to ensure that this research is practicable not in "laboratory" conditions, but in an "actual professional context." (Extract 6)

Extract 6 – Self-confrontation interview with the US

US: It's not easy because they (the PTs) have their own ideas about what research means. As if we were in a laboratory... So what I'm doing here is trying to say 'OK, but in an actual professional context, what does that mean?' They can't decide to sideline certain students like that, for example.

CH: So how do you deal with that?

US: For me, the main goal refers to setting up the experiment, and then, observing what consequences it has for the teacher or the pupils... For me, this is a sort of grey area between two worlds, research and teaching.

CH: It's complicated to reconcile the two...

US: Yes, but at the same time, if you don't reconcile the two, then I don't think you're adequately preparing them to conduct their own experiments in their careers as teachers... That's the ultimate goal really, to conduct a research with a professional bent.



It is somewhat paradoxical to note that it is the US who limits the irrepressible motivation of the PTs to engage, unreservedly, with a rigorous approach to research. Obviously, in this situation, the US concern is not to inhibit the engagement of the PTs with the research, but rather to ensure that their work remains viable and can be transferred to the (almost) ordinary classroom environment (motive). In this manner, the US expects to develop the future teachers' professional capacity to conduct “research with a professional bent”.

### **3. Discussion: the necessary conditions for implementing a developmental research-based approach to teacher training**

Considering the results of our study, this last part of the article deals with the task of discussing the functional conditions for implementing a developmental research-based teacher education.

The first condition concerns the anchoring of university training in the students' professional experience to promote stronger partnerships between university training and practical work in the classroom (Sim, 2006). In particular, the results of our study show that the process consisting of the students in: (1) identifying the difficulties experienced in their practice in class during the training sessions, (2) analyzing them among peers, and (3) comparing them with the academic knowledge of a literature review promotes the construction of solutions to transform their professional practice. So, a developmental research-based approach to teacher education implies that both scientific knowledge and research methodology be focused on the analysis of real professional difficulties that PTs encountered in the classroom. Our results also show that the implementation of a developmental research-based approach borrows skills from research activity to promote the PTs' professional skills construction. (Moulding, Stewart & Dunmeyer, 2014). Finally, they highlight the important role of USs, in their goal to support PTs, analyzing audio-video recordings of classroom exercises, and learning interview methods to describe lived

experience in the classroom. In addition, various studies have highlighted the importance of forging closer links between the professional practices of PTs and the content of their university education, including efforts to strengthen collaboration between the US and the CTs (Cartaut & Bertone, 2009), and to experience more “integrative” alternating work (Authors, 2016; Thornley and al., 2004). Adequately preparing PTs to experiment with professional solutions in the classroom implies that USs and CTs adhere to a common teaching strategy and coordinate course content. This strategy aims at equipping PTs with the necessary skills to: (1) transform a professional question into a research question (Earley, 2014), (2) contextualize their disciplinary knowledge (Heusdens et al., 2016), and (3) assess the feasibility of a question (Krell & Dana, 2012) and to develop the research design (Geerdink et al., 2016).

The second condition specifically concerns the temporal organization of training periods at university and work experience. As such, the major issue of implementing a developmental research-based approach to teacher training is specific to the conditions that make possible or impossible the development of PT’s activity (Vygotsky, 1934/1986). This finding is particularly linked to the purposes of the French initial teacher education which is mainly focused on the selection procedures for teachers and civil servants. This issue has three main implications. First, the time allotted to research in training programs is reduced. Second, the training sessions are built on a short-term view of professional development. Third, for the majority of PTs, succeeding in the competition means more finalizing a training program rather than entering into a new step of professionalization allowing time to research considerations. The results of our study show the necessity to give time, but also to support, the articulation between research practices and teaching practices in class. This articulation should allow PTs to start their research process (especially the implementation of a research method to collect data) and to develop this process in the classroom. From these

considerations, implementing a developmental perspective consists in maintaining a dynamic reciprocal link between the empirical dimension of the experience, the conceptualization of new actions, and the experimentation of practical solutions over a sufficient long training period. This iterative process embedded in a research-based approach to teacher education is designed to foster the articulation of the university training periods and the ones of work experience.

The third condition brings us back to one of the key principles underpinning our cultural and social approach. The results of our study emphasize how this approach provides a favorable context for the professional skill construction teachers need to accomplish their daily work. This professional skill consists in collaborating to analyze a professional issue and build solutions to this issue together. A developmental research-based model of teacher education must create opportunities for collective, reflective praxis among PTs scaffolded by the USs. This collective work aims at ensuring that the individual difficulties encountered by each PT become shared problems, and encouraging PTs to help one another in a potential co-construction of solutions. Therefore, a developmental research-based approach to teacher education should retain a resolutely social perspective. On the one hand, this suggests creating a cooperative educational climate by training PTs to conduct constructive dialogue, supporting collective agency (Bandura, 2006). On the other hand, this implies supporting PTs as they experiment new solutions capable of bringing concrete, practical, and sustainable transformations (Legrain et al., 2021). Finally, implementing a developmental research-based approach to teacher training also raises questions about the purpose of every University and Teaching Center. This is particularly so for continuing teacher training and trainers' professional development with the challenge of adequately preparing the instructors to set PTs in a process of ongoing professional growth (Darling-Hammond, 2017).

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