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Helping lecturers address and *formulate* teaching challenges: an exploratory study

Ignasi Florensa[1], Marianna Bosch[2], Jordi Cuadros[2] and Josep Gascón[3]

[1]Escola Salesiana Universitaria de Sarrià in Barcelona, Spain, iflorensa@euss.es; [2]IQS School of Management, Univ. Ramon Llull, Barcelona, Spain; [3]Dep. Matemàtiques, Univ. Autònoma de Barcelona, Spain

In this paper we present an exploratory study on the kind of questions or difficulties lecturers point out at the beginning of an educational course – to be addressed in it. These questions happen to be very general and are poorly connected to the knowledge to be taught. We suggest a twofold interpretation of this phenomenon. On the one hand, and in the line of the didactic transposition theory, teachers do not allow themselves to raise questions about the knowledge that is supposed to be their main field of expertise. On the other hand, the prevailing institutional pedagogy does not provide teachers with a fruitful enough conceptual frame to formulate this kind of questions. From the experience of several lecturer education courses, we postulate that didactics can help university teachers better interpret their practice and question it in a more productive way.

Key-words: university teacher education, pedagogy, knowledge to be taught, scale of levels of codeterminacy, teacher problems.

INTRODUCTION: THE PROBLEMS TEACHERS FACE

Since 2009, our research group has designed and implemented two different courses to provide university lecturers and research assistants with educational tools enabling them to better design, implement and analyse teaching and learning processes. The first course took place at IQS – Universitat Ramon Llull in Barcelona, an institution offering degrees and master programmes in engineering and management. This first course was addressed to PhD students teaching at the institution or planning to teach soon. The PhD students' research domains and subjects taught were diverse and included econometry, finance, mathematics and engineering, among others. The course was structured into thirteen 2-hour sessions and lasted 4 academic years. In the first session, the participants were asked to raise teaching questions they would like to address in the course. The collected questions were then classified according to the level of co-determinacy they affected (Chevallard, 2002, we will come back to this notion later). The subsequent sessions were each devoted to addressing the questions that belonged to one of the levels, starting from the general ones (Civilisation, Society) and finishing with the content-specific ones (Domain, Sector, Theme, Question). At the end of the course students were asked to design a teaching project for a subject of their specialty, including a syllabus, the planning of learning goals and a detailed description of three teaching activities: a lecture, a student-centred task and an autonomous out-of-class activity.

The second course was held at EUSS-UAB in Barcelona, an engineering school offering Mechanical, Electronic, Electrical and Management engineering degrees. The participants were in-service teachers with different educational backgrounds and research fields. The course was organised in six 2-hour sessions. It was based on a *study and research path for teacher education*, an inquiry-based teaching format focused on the study of a professional teaching question (Florensa, Bosch, & Gascón, 2017). The question addressed was "Could modelling be the main motivation of my subject?" It was approached through different phases where participants experienced an inquiry study process in the position of the students, then analysed the process experienced and finished by designing an inquiry study process for their subjects.

Both courses started by asking the participants to provide a list of questions or difficulties they would like to address with the help of the educators. In all the cases, we were surprised to find there was only a small number of questions that dealt specifically with the knowledge to be taught. Teachers mainly mentioned general issues related to assessment, class management, coordination or student characteristics (diversity, lack of motivation, the role of mathematics in their subject, etc.). They rarely included their subjects in the questions and, when they did, the problems formulated were very general.

We compared this result with an investigation research carried out by Cirade (2006) in pre-service teacher education in France within the anthropological theory of the didactic (ATD). In this research, during 3 editions of a 25-week course in 3 academic years, the participants who were doing an internship in secondary schools were asked to formulate a question every week. These "questions of the week" constituted the basis of the course, despite the fact that only a small sample of them could be addressed – all in all, more than 7,000 questions were collected. Cirade provides a systematic gathering and analysis of the teacher-students' spontaneous questions and uses them to identify the mathematical difficulties teachers encountered and their trouble in making them explicit. The kind of questions raised at the beginning of the course – which coincided with the beginning of the academic year – were initially very general, and were related to how to behave in class, how to manage the students' behaviour, what to do in a meeting with parents, etc. Then, as the teacher education course progressed and certain tools coming from the field of didactics of mathematics were introduced, teacher-students became more and more able to state questions related to the knowledge to be taught. In a sense, we can say that they stopped taking the knowledge to be taught as a given and dared to state questions about their own field of expertise. For instance, they ended up asking questions such as "How to justify the need of sketching functions given their analytical expression?", or "Why do we need to measure angles in radians in addition to degrees?", etc.

Following Cirade (Chevallard & Cirade, 2010; Cirade, 2006), we postulate that educational courses for university teachers cannot ignore the way teachers problematize their professional practice and teachers should take their concerns and

difficulties as the starting point of educational processes. Besides, as researchers in mathematics education, we also agree with the importance of approaching these questions from a discipline-based level. As stated by Berthiaume (2009, p. 215):

> For some time now, educational researchers have investigated the idea that, in order to be effective, higher education teaching may have to be 'discipline-specific'. In other words, teaching in higher education has to take into account the specific characteristics of the discipline being taught. This means that developing an understanding of teaching and learning is not sufficient to become an effective teacher in higher education. Rather, one must also develop an understanding of the teaching and learning requirements of one's own discipline. This has been termed 'discipline-specific pedagogical knowledge'.

We consider essential for university teachers to be able to formulate their difficulties, not only as general issues concerning students and class management, but also including the knowledge to be taught as a key element. Even if teaching problems are initially perceived as general in their manifestation, the way to address them will necessarily involve knowledge-based activities. From the perspective of the ATD, taking the knowledge to be taught into account means more than simply including it as a variable or parameter of the problem formulation. It also means considering it as an institutional construction, questioning its current shape and searching for possible new reorganisations, taking into account – without assuming – the epistemologies and pedagogies prevailing at the university (Barquero, Bosch, & Gascón, 2013).

The aim of our study, which is still at an exploratory stage, is to analyse the kind of questions university teachers are able to state at the beginning of an educational course – as the ones we implemented – and locate their questions at different levels of specificity/generality regarding the knowledge to be taught. We postulate that knowledge in didactics is important to provide university teachers with conceptual and methodological tools not only to improve their professional practice, but also to describe, interpret, conceive and question it in a more productive way. The first step to make progress in this direction is to start understanding how lecturers spontaneously formulate the challenges faced during their daily practice.

WHAT PROBLEMS DO LECTURERS SET FORTH?

We collected a total of 143 questions from the 4 courses, 35-40 per course, each of which was attended by 10-15 participants. In all of the cases, teachers attending the course were asked the following: "Write down two or three problems, difficulties or doubts that you find, or you think you may find during your teaching practice." There was a lot of redundancy in the questions, so we eliminated repetitions even if the phrasing was different. We are presenting this selection according to the questions' generality, using the scale of levels of didactic co-determinacy. This tool was introduced by Chevallard (2002) in the didactic analysis to include aspects of the institutional organisation of teaching and learning processes that are usually taken for granted (Artigue & Winsløw

2010; Chevallard & Sensevy, 2014). It helps distinguish the conditions and constraints affecting teaching and learning processes that are originated within the discipline, and the generic levels common to the teaching of any discipline:

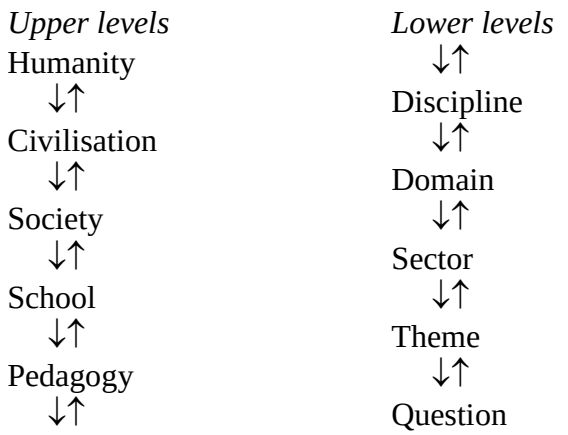


Figure 1. Scale of levels of didactic co-determinacy

Civilisation and Society

The upper levels of the scale refer to the conditions that are set up by our society or, when these are common to several societies, by the civilisation they belong to. We identified the following questions at this level:

- What to do in a culture in which effort and reward are no longer related?
- How does a social situation influence the effectiveness of a course or a teaching format? For example, the students' attitude seems different in times of crisis…
- To what extent should study plans be aligned with the labour market?
- What is "academic freedom" and what are its limits?
- Where do competencies come from? How are they established?
- Clashing of (generational or social?) values: sometimes it is difficult to act as a teacher, a guide or a referent when our own values seem to be obsolete (or to strongly contrast with those of our students). For example: the value of effort, the gratification of work well done, the fact that money cannot buy everything or that not everything is on the web, the importance of culture, of thinking, that there are things that are "right" and others that are "wrong" (e.g. cheating in an exam is "wrong"), etc.
- What to do with students who act as "clients"?
- The application of Bologna is an adaptation of the learning process and an evolution or change: more participative students, more teacher-student interaction, etc. Adaptability is therefore considered a consequence of an evolution, but if we analyse it, we are giving the same classes, in the same environment, with the same student profile. Can we do anything to make the context change?
- How is the knowledge of the different subjects selected and what criteria are used?
- How far should we, as teachers, arrive in our role in and out of class? What are teachers educated for?

As we can see, all these questions refer to dimensions or difficulties related to university teaching that do not depend on the specific institution considered – many of them can be extended to any kind of teaching and to other educational levels. What is questioned is the way our societies – more or less explicitly – conceive, organise, and manage the dissemination of knowledge, and the general roles assigned to teachers as guides, leaders or knowledge disseminators.

School (here University)

The School level includes the conditions and constraints that depend on the specific teaching institution considered, in our case, the University with its own specificities:

- Is the number of students per class important in terms of effectiveness of the teaching? Is there an optimal number? Are there exceptions?
- How are decisions regarding time-schedule, session duration, etc. taken?
- To what extent are university facilities important? Are there optimal premises? How to adapt to the ones available?
- How to respond to the pressure of introducing ICT in the classroom? Is it used because of real educational reasons or is it cost saving? Is it just a trend?
- How to ensure a good coordination between teachers of the same subject? What happens when they have a different conception of the subject to teach?
- How to establish more synergies between colleagues, sharing methodologies?
- How to ensure a coherent programme? What relationships exist between subjects?
- How to integrate the different subjects to obtain a more global education?

These questions also reveal the aspects teachers think can be changed and the ones they take for granted, not even considering them questionable. For instance, in the fifth question, only the coordination with teachers of the same subject is considered, according to the traditional compartmentalization of knowledge in higher education. Together with the sixth question, they reveal the lack of a professional culture that might include coordination between teachers. However, the sixth question seems to consider that this coordination only affects "methodologies", which again appears to be a vague and general dimension of teaching. The last two questions are content-related, but only with respect to the relationships between subjects, as these are considered to be previously determined – and, therefore, untouchable.

Pedagogy

The level of pedagogy is common to the different subjects or disciplines that can be taught. It includes all the resources, formats, and strategies teachers and students activate – many times without even noticing it – for teaching and learning processes to take place. We gathered numerous questions that can be located at this level of the scale and organised them into two main blocks: students and lecturers.

Students

- How to manage long projects, where students slack off and decrease their work intensity? How to reach a balance between establishing milestones and letting students work independently?
- What to do with the students that chat, are unfocused, use their mobile phone, do other things than what is requested of them?
- How to deal with student diversity?
- How to arouse the students' interest in subjects that are not at the core of the degree?
- How to motivate students beyond the minimum required "pass" grade?
- How to encourage students to participate in a large group?
- Should students be monitored closely or should they work more independently?
- How to motivate students to behave in class?
- How to encourage students to be more competitive through the intrinsic values of the subject that is taught?
- Students are not previously taught how "to learn". How will this affect our job?
- How to teach students to listen and maintain their attention?

Lecturers

- How to improve oral and body expression?
- How to organise assessment in a fair and impartial way?
- How to assess core (non-disciplinary) competencies?
- Is it better to use final examinations or continuous assessment? How to measure long-term student learning outcomes?
- How to design contents, planning and methodologies of the subject that take into account the student diversity?
- How to reach all the students and not only those who have more knowledge, excluding the ones that got lost? How to find the balance between maximising student learning and the amount of information provided?
- How to ensure an individualised methodology considering the time limitations?
- How to become the best teacher for each student?
- How to deal with the so-called "decline in student knowledge"?
- Does the decline in student knowledge correspond to something real or is it just what each generation says about the previous one?
- Does it make sense to give lectures nowadays?
- How to improve teaching resources and methodologies using ICT?
- What to do after the class? How to analyse what happened and what the teacher did? How to assess teacher performance?

As can be seen from the questions above, most of them focus on specific teaching practices, but they do not refer to the difficulties of the corresponding subjects. The questions are mainly related to what the teachers can or might do, and they are very general. Only two of them refer to specific teaching formats: projects and lectures. There is no mention of the activities organised (labs, tutorials, problem solving or case study sessions, outdoor activities, etc.) and the way to better implement them.

The need to implement new kinds of activities is not mentioned. The questions mainly have to do with the teacher and the teacher's actions. For instance: assessment is always considered as a lecturer's task; "motivation" is assumed to be generated (only) by the teacher. The questions thus reveal many features of the traditional pedagogical contract, which seems to be fully assumed by the lecturers.

Discipline

As said before, we were astonished to find so few questions at this level, which corresponds to the conditions and constraints directly linked to the content taught and learned. They can be related to the general discipline the content belongs to (Mathematics, Engineering, Economics, Management, etc.) or to the different components of the discipline, according to the way it is structured or delimitated in the considered institution. The general terms used to specify these levels are: domains, sectors, themes, tasks or questions. The divisions and boundaries established in a discipline or field of knowledge are institutional constructions. They vary from one institution to another and from one historical moment to another. The collected questions at this level remain very general; none of them specifies the difficulties related to the teaching or learning of a given piece of content. The first one, for instance, is very similar to those located at the School level: it depends on whether we interpret the question as affecting the design of an entire programme or the possible actions in one discipline:

- How to better connect the different subjects of the programme?
- How to highlight the multi-disciplinary nature of the subjects?
- How to select the learning goals of the subject? What content should be included?
- What should the level of the learning goals be?
- How to relate the subject with the real world?
- How to balance learning goals between specialisation and generalization?

WHY THESE QUESTIONS? AN INTERPRETATION FROM THE ATD

The assumed educational contract between lecturers and educators

The first reason that came to our mind when trying to understand why lecturers did not ask any content-related question is the kind of implicit didactic contract that was assumed by them at the beginning of the course. Given the fact that the course was about university teaching, they might have expected to learn certain generic tools to help them in their teaching practice; not something related to their specific subject. The educators were seen as specialists in teaching processes and the questions were stated at this general level. Either way, this shows a first important phenomenon: lecturers expect to receive help with general teaching practices that are only a part of their daily practice. A lot of their teaching work (elaboration of the syllabus; choice of textbooks, reference books and other kind of resources or materials; selection, design and organisation of activities, cases or problems; decisions about the kind of

in-class and out-of-class activities students should carry out; renewal of the subject matter; etc.) does not seem to have been included in the objectives of the course.

A problem of legitimacy

The second reason we put forward is related to what we call a problem of legitimacy. University teachers are often also researchers or at least experts in the subject they teach. Therefore, they may be reluctant to accept the idea that their teaching difficulties might come from problems with the subject matter they are supposed to master. Their lack of expertise can only be attributable to what is external to the discipline they teach. This reinforces the previous reason about their expectations from the educational course.

The divide between pedagogy and didactics

There is another important and more general factor that may explain the lack of content-related questions. It corresponds to the dominant interpretation of teaching and learning phenomena that has been called "pedagogical generalism" (Gascón & Bosch, 2007) or the "didactic divide" between pedagogical and subject-matter knowledge (Bergsten & Grevholm, 2004). It tends to introduce a strict separation between instructional processes and the "content" of these processes, that is, using the scale of didactic co-determinacy, between the level of Discipline and the level of Pedagogy. The main point in crossing the boundary between the two levels is the way knowledge is conceived in the considered teaching process or, in other words, which aspects of the subject-matter are questioned and which ones are assumed as a given.

When a teacher – or a lecturer – is asked to teach a given piece of knowledge *k*, the first question she will first ask herself is "what should I do to teach *k*?", not "what is this *k* I should teach?" What the theory of the didactic transposition (Chevallard, 1985; Chevallard & Bosch, 2014) states is that instructional processes rely on the fiction that there is only one way to define *k* and that this is the *k* that is taught and learned. Questioning the knowledge to be taught, asking about its origin, selecting and applying a given instructional process rarely occur. This is why it is normal the participants of the course did not set forth questions of that kind. In the questions stated, knowledge always appears as a given, not as a variable.

The "pedagogical generalism" that is found in the teachers' questions is not an isolated fact. If we look at the teaching support some universities offer their (new) faculty, we see that only the Pedagogical level is addressed, and possibly some aspects of the School level. For instance, in the *Teacher Training in Higher Education* (FDES)[1] programme proposed by the Autonomous University of Barcelona, the structure of the programme is presented as follows:

[1]http://www.uab.cat/web/personal-uab/personal-uab/personal-academic-i-investigador/formacio-i-innovacio-docent/programa-fdes/estructura-1345703511726.html

Activity 1. Teaching in the new context of learning and teaching
Activity 2. Practicing oral discourse
Activity 3. How to assess university students' learning?
Activity 4. Experiences in educational innovation
Activity 5. Observation in the classroom
Activity 6. Teaching planning: from study programmes to syllabus
Activity 7. Teacher's portfolio

Similar programmes can be found at other universities. For example, some years ago, the *Teaching Engagement Program* of the University of Oregon posted a list of frequently asked questions (FAQs) organised according to the following headings: "Getting ready to teach; Presenting and facilitating information; Motivating students; Questions of respect; Assessment; Managing the classroom climate". None of the questions was content-related. It seemed as if, once certain answers were provided to the pedagogical issues, their specification to the subject-matter was considered evident or, at least, non-problematic.

CONCLUSION: A LACK OF TOOLS AND NOTIONS

One of the consequences of "pedagogical generalism", that can partially be seen in the questions stated by university teachers, is the lack of terms and concepts to go below the level of Pedagogy and start questioning the levels of Discipline. University teachers develop their professional activity at institutions where little is said about the way knowledge should be selected, arranged, updated, organised, "elementarised", put-into-practice, problematized, etc. in order to teach it or to help students to learn it. This is a crucial aspect in which the results obtained from research in Didactics of Mathematics, both practical and theoretical, can assume an important function.

From the experience of the courses here presented, we have seen how introducing certain elements of the ATD (the notions of praxeology, didactic contract, didactic moments, Herbartian schema, media-milieu dialectics, didactic ecology, etc.) provides lecturers with a productive enough framework to talk about and start questioning a larger part of their teaching activities (Florensa, Bosch, Gascón, & Ruiz-Munzon, 2017). The more is said about didactic processes, the more dimensions of these processes can be questioned and tentatively changed. Our hope is that the education of lecturers, as is the case with primary and secondary school teacher education, will have the power to make this state of things evolve. Our experience with the courses presented lets us be moderately optimistic in this respect.

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REFERENCES

Artigue, M., & Winsløw, C. (2010). International Comparative Studies on Mathematics Education : a Viewpoint From the Anthropological Theory of Didactics. *Recherches en Didactique des Mathématiques*, *31*(1), 47-82.

Barquero, B., Bosch, M., & Gascón, J. (2013). The ecological dimension in teaching of mathematical modelling at university. *Recherches en Didactique des Mathématiques*, *33*, 307-338.

Bergsten, C., & Grevholm, B. (2004). The didactic divide and the education of teachers of mathematics in Sweden. *NOMAD*, *9*(2), 123-144.

Berthiaume, D. (2009). Teaching in the disciplines. In H. Fry, S. Ketteridge, & S. Marshall (Eds.), *A Handbook for Teaching and Learning in Higher Education* (pp. 215-225). Oxon: Taylor & Francis.

Chevallard, Y. (1985). *La transposition didactique. Du savoir savant au savoir enseigné.* Grenoble, France: La Pensée sauvage.

Chevallard, Y. (2002). Organiser l'étude. Écologie & regulation. *11ème École d'Été de Didactique des Mathématiques* (pp. 41-56). Grenoble: La Pensée sauvage.

Chevallard, Y., & Bosch, M. (2014). Didactic transposition in Mathematics Education. In S. Lerman (Ed.), *ACM Encyclopedia of Mathematics Education* (pp. 170–174). Dordrecht, The Netherlands: Springer.

Chevallard, Y., & Cirade, G. (2010). Les ressources manquantes comme problème professionnel. In G. Gueudet & L. Trouche (Eds.), *Ressources vives. Le travail documentaire des professeurs en mathématiques* (pp. 41-55). Rennes, France: PUR and Paris: INRP.

Chevallard, Y., & Sensevy, G. (2014). Anthropological Approaches in Mathematics Education, French perspectives. In S. Lerman (Ed.), *ACM Encyclopedia of Mathematics Education* (pp. 38-43). Dordrecht, The Netherlands: Springer.

Cirade, G. (2006). *Devenir professeur de mathématiques: entre problèmes de la profession et formation en IUFM . Les mathématiques comme problème professionnel. (Doctoral Dissertation)*. Université d'Aix-Marseille.

Florensa, I., Bosch, M., & Gascón, J. (2017). Formación didáctica del profesorado universitario: análisis de un curso. In J. M. Muñoz-Escolano, A. Arnal-Bailera, P. Beltrán-Pellicer, M. L. Callejo, & J. Carrillo (Eds.), *XXI Simposio de la Sociedad Española en Investigación en Educación Matemática* (pp. 237-247). Zaragoza.

Florensa, I., Bosch, M., Gascón, J., & Ruiz-Munzon, N. (2017). Teaching didactics to lecturers : a challenging field. In *10th Conference of European Research in Mathematics Education - CERME10*. Dublin.

Gascón, J., & Bosch, M. (2007). La miseria del "generalismo pedagógico" ante el problema de la formación del profesorado. In L. Ruiz-Higueras, F. Estepa, & F. J. Garcia (Eds.), *Sociedad, Escuela y Matemáticas. Aportaciones de la teoría Antropológica de lo Didáctico* (pp. 201-240). Jaén, Spain: Servicio de Publicaciones de la Universidad de Jaén.