

Learning from experience: The teacher's perspective

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Abstract— This communication assesses the issue “Teachers learn and improve, they're not born experts”. I present a personal reflection, based on a bibliographic review, on the one hand, and on my thirty years of experience of teaching in a higher education institution, the Faculty of Engineering of Porto University (Portugal), on the other.

Along this way, I can reaffirm the importance of learning from experience, through which teachers come to learn with different interlocutors, with different technologies, and with different teaching/learning methodologies.

Teachers' learning processes (like students' ones) are diversified and based on written, oral, hearing, sensory, and even on a kinaesthetic apprehension (that combines several feelings and senses). So teachers learn not only through cognitive stimulation. They also learn with their students (either in the scope of the classroom or in extra-class talks), with their colleagues (informally and/or in the scope of conferences and meetings to discuss pedagogic themes and practices), and with new technologies and teaching methodologies (in workshops or in conferences/debates).

Teachers' learning processes (like students' learning processes) are mainly based on cognitive learning, which enables the insertion of different contents into the cognitive structure, in an organised way, thus engendering an arranged information complex ([1];[2];[3]). Teachers' “learning from experience” is based on this cognitive ability to learn with experiences, attempts, achievements, and mistakes. This cognitive stimulation may be triggered resorting, in the scope of the classes, to the use of modern technologies applied to real world problems, raising awareness and motivating students for specific teaching sessions.

The experience gained by teachers along their careers is relevant in what concerns their knowledge of students' features, behaviours and attitudes (according to their age group), and the awareness of the evolution of their motivations, beliefs, tastes, and preferences. The learning processes are reciprocal between teachers and students: students learn from teachers, but the opposite is noticeable as well. Some good examples are the challenges often posed in classes by most proactive, critical, and inquisitive students, or even students' mastery of computational techniques and software.

Learning and teaching have increasingly resorted to new methodologies. Such is the case of “active learning processes”, “problem-based learning”, “flipped learning”, “distance learning” (electronic-learning and blended-learning, the former consisting in virtual classes and the latter in its conjunction with face to face classes), functional education, and the use of new platforms as google or moodle, or even apps (for instance, applications to support foreign language learning) ([4];[5];[6];[7];[8];[9]).

These new methodologies represent a challenge for teachers, as they force them to rethink the contents of the curricular units, and, especially, the ways in which they should convey knowledge in order to increase its impact and the strength of their

messages.

In brief, each learning moment represents a new challenge and a new step forward in order to permanently improve teachers' knowledge, competences and skills.

Keywords—class interactivity, cognitive learning, teaching and learning methodologies, “tailor-made” classes

I. COGNITIVE PROCESSES

Teachers' learning processes (like students' learning processes) are mainly based on cognitive learning. The cognitive structure consists in a set of ideas on a certain subject, and on the way in which they are organised. It corresponds to a hierarchical structure of concepts.

The cognitive learning can be defined as the process by which certain contents are inserted into the cognitive structure, thus creating an organized complex of information [3]. Thus, external and internal stimuli - whether oral, hearing, sensory or kinaesthetic (through a combination of different feelings and senses) trigger learning processes, which lead to the acquisition of new knowledge, the development of intellectual capabilities, the development of skills, and the internalisation of behaviours, often leading to behavioural changes.

Professors' learning from experience is based on this cognitive ability to learn with experiences, attempts, achievements, and mistakes. This cognitive stimulation may be triggered resorting, in the scope of the classes, to the use of modern technologies applied to real world problems, raising awareness and motivating students for specific teaching sessions.

II. INTERACTIVITY WITH STUDENTS

The interactivity among students and teachers, among students themselves, and the report of different teaching/learning/assessment experiences by several students, from distinct origins and with different personal and professional features, enable everyone in class to benefit from experiences and knowledge of each one, each reality, each country, each standing in classes, and also each mental positioning and different learning forms and processes.

Besides, the need to resort to multilingual competences in multicultural environments fosters the mastery of foreign languages, communication, expression, abstraction and share of ideas, far beyond its formatting in a given language. It also widens the fields of research and interrelation between different sources and documents with distinct theoretical, doctrinal and practical influences ([11]; [12]). Students'

feedback (either through pedagogical surveys, or straight through talks, or discussion in classes) represents another important learning source for professors, as they support higher performances of their teaching practices.

III. NEW TECHNOLOGIES AND VIRTUAL CLASSES

In methodological terms, I have been developing my lessons to suit the students' needs, that is, I have been adjusting the teaching to the specific characteristics of each student and each group, which allows me to create differentiated, updated and interactive classroom environments.

Thus, in the first theoretical-practical lesson each student is encouraged to make a personal presentation, in which he/she describes his/her characteristics and academic and professional background, as well as the expectations regarding the curricular unit.

Although there are structured contents, the way the classes take place (especially the theoretical-practical classes) depends a lot on the discussion and sharing of ideas among the various participants, who are encouraged to participate and present their experiences and points of view.

Besides the evolution in the surrounding reality and the adjustments that naturally occurred over the years in the curricular subjects and teaching methodologies, the fact that the groups of students are different over time also changes the very ways of teaching, the lessons contents, and the emerging discussions.

These pedagogical practices of "tailor-made classes" have as objectives:

- To develop new ways of teaching, learning, and assessing
- To adjust the teaching methods, the way of transmitting knowledge and the development of skills to the specific characteristics, motivations and cognitive abilities of the participants in the classes
- To enrich the course content by discussing and integrating personal and professional knowledge and skills developed in different contexts, drawing on diverse educational backgrounds, knowledge and personal and professional experiences
- Ensure greater coordination and integration between the contents of the curricular unit and the other units of the course
- Develop communication, group interaction, cultural and linguistic skills
- Use new technologies for the transmission of knowledge independently of the physical limitations of the classroom and the time constraints of the teaching schedule
- Integrate different cultural contributions regarding the ways of teaching, learning and assessing the acquisition of knowledge and the development of skills, respecting the plurality of opinions and points of view

Furthermore, in my classes I have increasingly use

new teaching and learning methodologies based on active learning, problem-based learning, flipped learning, and distance learning (electronic-learning and blended-learning, the former consisting of virtual classes and the latter in conjunction with face-to-face classes), functional education, and new platforms such as google or moodle, or even apps (kahoot), or quizzes.

These new teaching methodologies and the use of digital platforms and software are a challenge for teachers because they force them to rethink the contents of the curricular units and, above all, the way they should transmit knowledge to increase the effectiveness of their messages.

"Flipped learning" methodologies consist in providing the students with material (articles, reports, videos, internet links) so that they can study certain contents and subjects before the lessons and then, during them, discuss and deepen them with their colleagues and teacher [10]. This deepening and consolidation of knowledge prior to the face-to-face classes trigger learning rhythms that are better adjusted to each student's own characteristics, fostering their motivation and commitment to the perception of the concepts and respective interrelationships and linkages (on which more specific knowledge is based).

I have also been resorting to Problem-based learning methodologies, which consist of formulating a given problem from a realistic perspective ([4]; [7]), without knowing in advance which is its best solution [8], and to propose its approach to groups of students (each group receive a different assignment, which enriches the classes for presentation and discussion where all students actively participate). In this way, students understand the problem better and closely follow its resolution, realising that the knowledge they draw on is useful for the practical implementation of the solution they propose ([6]; [7]; [8]; [9]; [13]). The teachers become more involved in the preparation of critical analysis and discussion lessons, adjusting them better to the interests of those specific groups of students. The students themselves can then better self-assess and self-regulate their own learning processes in a more motivated and autonomous way [10].

This methodology pursues the following objectives:

- To stimulate students' curiosity, motivation and interest, as they shape the knowledge they wish to acquire and the skills and competences they wish to deepen, according to their experiences and their own personal and professional background, which allows them to develop their thinking and critical reasoning in a more sustained way, and stimulates their more active participation in collaborative contexts
- To promote individual and group skills and abilities in contexts that reproduce conditions as close as possible to real-life situations (which students are likely to encounter - in some cases they have already encountered - at a professional level)
- To enable students to follow more closely the resolution of the proposed problems, which triggers their understanding, and increases their awareness on the usefulness of knowledge for the practical implementation of the solution they propose
- To develop strategic thinking skills in problem solving, enhancing autonomy in decision making and long term learning processes

- To enable students to carry out self-evaluation and self-regulation of their own learning processes in a more motivated and autonomous way

This methodology has required a great deal of involvement from me as a teacher, especially in terms of preparing lessons for critical analysis and discussion, and tailoring them better to the interests of specific groups of students.

These learning processes are also challenging for the students themselves, since they require the coordination of group work skills, and the discussion among them of the themes involved and the ways of structuring, organising and operationalizing the work developed. The working group is thus an important driver of intrinsic motivation for learning.

I have also been resorting to the use of new communication and information technologies, which increases the flexibility and sustainability of teaching and learning processes, enhancing their use in new contexts, integrating acquired knowledge with prior knowledge, freeing them from space and time, thus extending the traditional classroom to a virtual learning space/time ([14]; [15]; [16]; [17]). That is, as long as students want to learn, they will be able to do so and will have access to the sources of knowledge, regardless of where they are, and at times that are most convenient for them.

In a globalised world characterised by an excess of information (often contradictory and not always reliable), the teaching-learning processes become located in the student (and not in the teacher).

The use of modern technologies, in addition to meeting the students' interests and motivations, allows them to deepen their reasoning and critical thinking. They reserve an increasingly central role for teachers in deepening knowledge, developing the ability to reason and apply, and promoting the discussion of the topics taught and learned in class, stimulating interaction, rationalizing the use of the time resource, and relocating the space from the traditional classroom to a more comprehensive concept of virtual learning space ([14]; [15]; [16]; [17]).

These technologies imply greater awareness and accountability of the student, who is now oriented towards the construction of his/her own knowledge, which also requires a strong capacity for self-regulation and self-control of the learning processes [8]. These approaches foster the development of strategic thinking skills in problem solving, enhancing decision-making autonomy and long-term learning processes. They are strongly based on students' motivations and interests, and stimulate their curiosity, as they shape the knowledge they want to acquire and the skills and competencies they want to deepen, according to their experiences and their own personal and professional path. Therefore, they develop their thinking and critical reasoning in a more sustained way, and their active participation in collaborative contexts is encouraged [4]. In fact, the working group is an important factor of intrinsic motivation for learning ([18]; [19]).

The use of virtual classes as a complement to face-to-face classes fits into the current concerns of active learning,

functional education, problem-solving-based learning ([4]; [5]; [6]; [7]; [8]; [9]), and flipped learning [10], which have been increasingly guiding theoretical research and shaping the content of debates in higher education institutions.

By deepening and consolidating knowledge prior to face-to-face classes, and by stimulating different learning paces according to each student's characteristics, virtual classes made available on video develop the motivational background that serves as the basis for the development of teaching and learning processes, and involve students in a deeper understanding of concepts and the foundations on which specific knowledge is based. At the same time, these virtual classes require greater involvement of teachers in the preparation of classes for discussion and critical analysis, which allows them to be oriented more towards the students' own interests, who can thus, and in a more motivated, committed and autonomous way, self-regulate and self-assess their own learning processes [10].

In the future (and especially if the current pandemic circumstances continue) I intend to reinforce this methodology, namely through the use of video classes or synchronous classes for the presentation of subjects and distance exploration and discussion of contents. This allows students, provided they want to learn, easy and quick access to sources of knowledge, regardless of where they are, and at times that are most convenient for them.

The joint and harmonised use of these different typologies of teaching/learning methodologies promotes students' individual and group skills and competences [20] in problem-solving contexts increasingly closer to the conditions they will encounter in the course of their future professional activities. It further allows them to:

- carry out research work, analysis and critical reflection on current studies issues, in different realities, and subsequent discussion/debate in class
- pursue research of news or analysis published in the press, in scientific journals or on websites related to the subjects under study, and the respective critical analysis
- actively participate and discuss class contents with the teacher and among themselves
- Think critically, and relate the contents of the theoretical framework to the surrounding reality
- integrate different types of learning (in class, in supporting documentation, in self-guided research, in class participation and in the discussion of different assignments) in a consolidated body of knowledge, appropriate to the characteristics, knowledge, abilities, skills and experience of each student

IV CONCLUSIONS

Considering the growing use of new methodologies and new technologies (which allow extending the scope of the lessons beyond the time limits of the teaching schedule, and the spatial limits of the classroom), and the excess of information (often contradictory and not always reliable) that characterizes the increasingly globalized world in which we live, the teaching/learning processes have to be reinvented

and constantly adapted to change. They also require permanent interactivity between teachers and students, a greater need for creativity in the design of lessons, and flexibility to convey them to the specific characteristics of each student and each group, and to their interests, and life experiences, which entails a greater responsibility of all in the teaching and learning processes.

The student assumes a central role in the teaching and learning processes. This implies students' greater awareness and responsibility. They are more oriented towards the construction of their own knowledge and learning and the development of competences, which requires a strong capacity for self-regulation in the acquisition of knowledge and the development of skills and self-control in learning processes.

In this context, the teacher's role also changes substantially. Thus, the position I have been assuming has largely gone beyond the mere transmission of knowledge. I have been assuming other roles and functions, namely as a moderator of discussion, a facilitator of systematisation, and a guarantor of the plurality and diversity of points of view, stimulating the reasoning, application and interrelation of concepts, ideas, methodologies, and professional experiences, framing and promoting their critical discussion, stimulating interaction, and making more efficient use of time, in a way adjusted to the personality of each student and each group, and to their respective experiences [21].

To sum up, each learning moment represents a new challenge and a new step forward in order to permanently improve teachers' knowledge, competences and skills.

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