

## Botany classes' contextualization: A research work inside three Brazilian universities and a Portuguese one

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### Abstract

Contextualization is the act of linking knowledge to its origin and application. The purpose of the study is to understand how botanical teachers from three public universities in the state of São Paulo and a Portuguese university will contextualize scientific knowledge. Fifteen teachers from the four universities were observed throughout a semester. To analyze the data, we used the theory of land, in which all concepts are identified by data. As a result, it has been verified that most of the faculty mention examples of the botanical subjects they teach trying to relate the content to a more concrete reality. Historical contextualization is not addressed by most teachers, and so is the correlation between botanical knowledge and other topics in biology or subjects in other fields of knowledge. The lack of context in some classes underscores the difficulty teachers have in combining scientific knowledge with other issues in everyday student life.

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## Introduction

Contextualization is the act of linking knowledge to its origin and application; In other words, it is the connection of ideas, which contains the text as a whole, composition, group, total (Menezes & Santos, 2002). For Machado (2005), contextualizing is the enrichment of channels of communication between cultural knowledge and scientific knowledge, in order to link a reference or knowledge to a "text" or a context from which it has been extracted.

In the world, this theme is known as Contextualized Teaching and Learning (CTL), CTL as a concept of teaching and learning that helps teachers to link subject content to real-world situations (Berns & Erickson, 2001). Mazzeo et al. (2003) describe CTL as a diverse family of instructional strategies designed to more easily link learning of core competencies and academic or vocational content by focusing teaching and learning directly on concrete applications in a specific context considered of interest to the student.

Contextualization depends on how the teacher displays and introduces scientific knowledge in the classroom. Krasilchik (2008) makes several necessary changes to such an approach to knowledge: it reveals that content can be linked to the context of knowledge or its application, which can be inserted into a scientific context and at the same time linked to the context Socio-cultural.

The work of knowledge teachers in universities is in many respects strictly scientific and rooted in academic formalism. Many teachers choose what will be taught solely on the basis of content and later choose how this content will be tackled in the classroom by establishing a sequence in the class timeline (Masetto, 2003; Krasilchick, 2008). Masetto (2003) argues that higher education requires more than the command of scientific knowledge; it also requires a mastery of pedagogy, the learning process and the training of programs. He argues that the teacher's mediation must be situated in a context where the classroom works in three ways: it receives reality, works scientifically and comes back to it in a new way, enriched by science and new proposals for intervention. Menezes and Santos (2002) emphasize that each knowledge must have as its starting point the student's experience, the context in which he is inserted and in which he will act as a professional, a citizen and an active agent in his community. According to Morin (2002), it is necessary to be able to perceive the whole; it is necessary to be able to situate knowledge in its context.

Some authors go beyond and classify the types of contextualization according to the approach. According to Machado (2005), the context can be divided into three different categories: the personal and daily context of the students, which involves everything that happens around the subject and the

motivation of which arises from questions that are present in students' lives; the social context, that is how this knowledge is used by society and by scientific discoveries, where motivation is the search for knowledge; And the historical context, in relation to the moment and the situation in which the discovery or scientific knowledge is found, in which the process of constructing this knowledge is valued.

For Wartha and Alário (2005), there are three different approaches to contextualization: the first, as a learning-teaching strategy, when problem-solving or problem-solving is used as an approach to the theme; the second, as an illustration of the daily facts, in which the teacher presents real examples; And third, the development of attitudes and values for the education of critical citizenship, showing the social context in which the theme is inserted, thus enhancing the subject's education. For these authors, understanding the meaning of the situation is essential for the development of teaching strategies that can help prepare for the practice of citizenship.

Regarding the teaching of botany, Silva and colleagues (2009) argue that in primary and secondary education, the theme is addressed through lists of scientific names and words completely isolated from reality and used to define concepts that are difficult for students to understand. Thus, botanical classes are associated with terminology and decontextualized knowledge. In this same book, Silva and his collaborators (2009) mention the importance of putting botany in a natural environment so that the student can connect knowledge with his reality. These are the reasons for the development of this study.

In an environment where most professors express the student's lack of interest in botany, the development of an appropriate approach to botany and the need to improve botany teaching practices in particular the contextualization of subjects in the classroom. This work aims to contribute to a reflection on a formalization of botanical scientific knowledge in class and on the way in which contextualization is going to be carried out by botanical teachers. We have studied:

1. How are botanical classes contextualized in higher education?
2. What motivates teachers to adopt strategies, activities and teaching methods to contextualize their classes?

The present study aims to contribute to a reflection on the formalization of botanical scientific knowledge in class and how contextualization is to be carried out by botanical teachers.

## Methodology

### *Participants in the research process*

We have observed classes of botanical teachers in the fields of anatomy, morphology and systematics in three public universities in the State of São Paulo (A, B and C) and a Portuguese university (represented by D). All work in a fairly exclusive form and have their careers followed for a period ranging from 6 to 30 years.

### *University Research Framework*

University A has a program in which teachers from several botanical fields work together in the two classes of botanical core areas. We observed the classes taught by these teachers working in their reference fields (Systematics - 3A and 4A, Anatomy and morphology - 1A and 2A). It can be noted that the number of classes taught by a teacher is less than five, because the class is shared by 4 or 5 teachers.

As far as university B is concerned, it has a program in which the fields are subdivided. It was possible to observe more classes related to each teacher because, in some cases, the class had only one teacher or was subdivided by two professors. Expert professors also participated in some taxonomic groups, invited by the subject teacher to teach one or two classes. At this university, the core group consists of three botany subjects, the six professors working in the field of systematics (1B, 2B and 6B); morphology and plant anatomy (3B, 4B and 5B).

University C has the most complete botany program among the universities sampled: six subjects taught throughout the course (2nd, 3rd, 4th and 6th semester); four themes are taught by teachers of systematic morphology, anatomy and vegetation. All three teachers observed came from the areas of morphology and anatomy, there was no regular systematic teacher during the period when the classes were observed. These three teachers distribute the same subjects of anatomy and morphology. As a result, the number of observed classes is less than five, as happened at University A.

Finally, University D has two subjects in botany: general botany and plant physiology. At this university, two end-of-studies courses were analyzed (applied biology and biology-geology). The 1D teacher participates only in the applied biology program; The 2D teacher takes part in two courses of teaching of the two subjects in botany. In the Applied Biology program, the teachers distribute the same subject, the 1D teacher being responsible for the practical courses and the 2D teacher responsible for the theoretical courses. The subject was observed in both courses; Thus, the 2D teacher had 18 of their sampled classes.

### *Instruments*

In this work, only one researcher performed observation and interviews. Classroom observation was useful in verifying whether respondent discourse coincides with action; Moreover, it brings results of what is exercised in practice. In this work, the focus is on strategies used in teaching and their environment. Targeted observations limit it to empirical events and problems, and selective observations are descriptive and focus on specific aspects that attract the attention of the researcher and highlight examples and practices observed (Lankshear & Knobel, 2008;).

Interviews are widely used to express the respondent's views and perspectives (Flick, 2009). Interviews were conducted to obtain detailed information about classroom procedures that could not be obtained by observation (Lankshear & Knobel, 2008). In this context, the interviews were semi-structured and open, allowing the interviewee to explain his / her point of view on the subject.

### *Data analysis*

The data were analyzed according to the theory of Strauss and Corbin (2008), in which the concepts are properties and dimensions identified via the data. In this model, the theoretical codification was based on open codification, in which concepts are the constitutive elements of categories, a true representation of an object or an action (Strauss & Corbin, 2008). Lankshear and Knobel (2008) point out that this method is commonly used in observed data and qualitative research. By this type of approach, the events observed are detached and each element is compared with other similar phenomena, thus representing a category. The objective of open codification is to develop conceptual categories and sub-categories that can help describe and explain the observed phenomena (Strauss & Corbin, 2008).

From the data collected during the interviews, some extracts were highlighted to better represent the practice exercised by the teachers. In this data, the content was also analyzed according to the fundamental theory mentioned earlier (Strauss & Corbin, 2008), showing the reasons why the teacher interviewed performs a certain activity to contextualize his classes.

## Results and Discussion

### *Contextualization in the teaching of botany*

Four types of contextualization were identified among the teachers throughout the study: the historical scenario, when the teacher emphasizes how knowledge has been changed and how social and technological development has changed knowledge over time. It should be emphasized that the historiographical situation has been included in this

category because it shows similarities with regard to the given focus; Interdisciplinary contextualization, when the teacher highlights the relationship between the subject and the other related fields; the daily context of the students, and when the teacher inserts the classes in a local and regional situation that is part of the students' environment.

Teachers are accustomed to giving examples of plants (nine teachers). In the interview, the 4B teacher mentions the importance of illustration and the importance of bringing botanical subjects to the students' environment:

"I always say, I give examples, mostly I try to give examples from surrounding material and this excursion I take is around here, with this intention. Of course it is cool to take students to the "cerrado", to Atlantic rainforest. But will they be able to do that with their undergraduate, high school or primary school students? No, probably not, unless it is an elite school which has resources for that and I think about the students who wish to teach at a public school, so I show them the bushes which are around here, the practice class materials are the things we collect around here, (...)"

Of the nine teachers who give examples in class, two of them do not contextualize with the everyday life of the students. Machado (2005) reports that it is useless to give examples after presenting concepts if they are abstract and distant from the reality of the students. According to Machado (2005), teachers must motivate students by connecting knowledge to everyday life, to what the student experiences on a daily basis. Moreover, the contextualization of knowledge encourages a better integration in the classroom between the teacher and the student (Abreu & Masetto, 1987).

Eight professors carried out the contextualization through the daily environment of the students. This type of contextualization usually has a deeper approach than illustration. Kuenzer (1996) argues that everyday life cannot be explained by itself but by History and human relations with the world. Relationships that are either an exploitation or a type of solidarity and the submission or control of knowledge. Caldera (2009) reinforces the importance of historical contextualization in class, emphasizing the need for a conceptual understanding based on the structuring concepts of the knowledge on which we work.

Less than half of the teachers observed inserted botanical knowledge into the students' reality and interdisciplinary contextualization was an under-represented category: only five of the teachers from the three universities presented botanical subjects related to other areas of knowledge. Krasilchik (2008) points out that the relationship between the subject and other domains or subjects can be a challenge for the teacher, especially because the program creates boundaries between subjects. The historical

contextualization of knowledge has been demonstrated at University B by two teachers and at University D by a professor. Carneiro and Gastal (2005) argue that historical contextualization is generally set aside in favor of scientific contextualization in everyday life.

### *Why to contextualize?*

Two teachers showed a greater frequency of contextual activities because they tried to work the subjects in the classroom in a more contextualized way. The 1B teacher was one of them, being the Brazilian teacher who has put the most into context, whatever the type of situation. As a result, he was asked to bring examples of plants that exist in our surroundings and what was the purpose of this contextualization of teaching:

"My purpose is to make people see what they are looking at because, as I have said many times, the way we have been educated since childhood values the organisms which are closer to us. They are either mammals or vertebrates. It is a matter of self-reflection, a mirror thing, the desire of trying to see what is closer to you. In this sense, plants are simply plants or bush, or a little flower, so we misguided from childhood in relation to what to see, what to observe. For the untrained eye, there is certain homogeneity in vegetables. People are educated only to distinguish what is or isn't edible, if it can be used as decoration or medicine or if it is poisonous. So, this reflects man's utilitarian point of view, and the vegetal systematic class can show people the distinction among the different groups and lead them to look at them. (...) What I try to do is: "You know this plant; it is planted in front of your house, it is beside your cafeteria." Look at that; it exists; it is not landscape". What I try to do is to remove angiosperms, which is the class object, from anonymity. Whether they are going to use that only for their education or to become better biologists or if it is going to work as a hook to use it as material for the practical class when they become teachers or when they develop some teaching activity, that is their own business, (...). But the fact that I cite plants that are not present in our daily lives is to recover plants from anonymity, which is the very soul of taxonomy."

His discourse reveals a set of factors that lead this teacher to contextualize knowledge, as well as the importance of this "retrieval" of socio-culturally contextualized knowledge. This type of contextualization is what Pimenta and Anastasiou (2010) call reflexive mediation, which consists in linking the students' act of learning with knowledge in impregnation, produced by and constituting society. The teacher's work is therefore very complex because it involves different types of knowledge, such as scientific knowledge, their experiences as teachers, pedagogical knowledge, the relation between the content and the experiences of the

subject with the meaning given by the Society to knowledge. Moreover, the teacher we have just mentioned attempts to change the notion that plants are only landscape components. This idea that plants make up the landscape is known as botanical blindness (Wandersee & Schussler, 2001).

When one thinks of the context in which university teachers are inserted and which implies a specialized language and a curricular structure established in blocks of knowledge, one can understand how difficult it is to contextualize. Pimenta and Anastasiou (2010) argue that transformation in teaching practices is effective only when teachers become more aware of their own practice within the classroom and in the academic world.

The second teacher who also contextualized was the 2D teacher. One of the most intriguing facts is that the teacher chose the first class to contextualize the theme of botany. The theme of the class was the need to study botany. When asked why they chose to present this topic in the first class, the teacher said that the important thing is to draw students' attention to botany:

“In fact this class could have been the last one. But doing it on the first day I draw everyone's attention to botany. They always have a wrong idea about botany. I think the idea they have is: “Ok, let's go outside see what a little flower is and classify that into a certain order, class and whatever”. They don't realize the importance of studying the vegetal part. Therefore, it is important to study beyond a taxonomic point of view. We study botany to know plants. It is important to study plants to show them that taxonomy is not everything. Plants are a series of compounds they handle daily. So, the objective is to attract them to botany. And I have to confess something I need to confess: I have already been a member of the Board in a Master course committee and now I am the director in another Master course in the field of plants and deep down, I try to wake students' interest in the vegetal field.”

It may be noted that the objective of the first class is to contextualize botany and to show its importance. For this teacher, presenting the theme is not enough; It is necessary to motivate students to study plants. Whether it is a first class or a program to be taught throughout the year, the teacher must mobilize several types of knowledge and skills, as their action is oriented towards several objectives: emotional Student motivation, classroom management; Cognitive objectives concerning the learning of the content taught; The objectives of the group concerning the school curriculum, etc. (Tardif, 2000). Tardif also points out that motivation is an important factor in ensuring learning. For them to learn, students must be motivated. Motivating students is an emotional and social activity that requires complex

mediations of human interaction: seduction, persuasion, authority, rhetoric, rewards, punishment.

These two teachers demonstrate the importance of contextualization aimed at meaningful student learning, trying to bring them concepts of botany related to the context of knowledge and / or everyday context. It is important to note that these teachers are concerned about learning, not just about teaching. The learning-learning process as a whole is valued when the teacher is interested in student learning.

### Final Remarks

These two teachers have shown a teaching of botany based on scientific knowledge, approaching a specific language. Many times, this knowledge is inserted into the daily life of students, mainly through examples. It is important to note that for most of the teachers of this study, scientific knowledge is inserted into a situation, whatever the type of contextualization.

The lack of context has been observed in certain classes, it is a common characteristic among teachers. This shows that professors dissociate scientific knowledge from their environment; Whether historical, interdisciplinary or everyday. The contextualization observed is without awareness. This occurs because of the need for an approach that brings students' scientific knowledge closer together. Therefore, for higher education, there are no guidelines or parameters that regulate, integrate or value the contextualization of scientific knowledge. This indicates that teachers should be aware of their role in the classroom and of their duties within the university.

Contextualization of content not only involves students' understanding of scientific knowledge. Contextualizing teaching means integrating concrete and differentiated experiences, in addition to scientific breakthroughs. This type of approach allows an interaction between the teacher and the students, develops a reflective and critical knowledge, the training of a professional who is able to understand the socio-cultural context in which this knowledge and other themes can be inserted.

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