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Situated Learning of Management Competencies in the Practice of a Community

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Abstract*— *Aiming to understand how the situated learning of managerial competencies, which occurs in the social practice of a student community, contributes to the schooling of those who participate in it, this article presents the results of a qualitative research. The research was done through participant observation, backed up in a field diary, interviews and photographs. The results revealed that, in the process of situated learning of managerial competencies that takes place in practice of community, the interweaving of "knowing" to "doing" ensues, contributing to fill the theoretical and epistemological gap existing between the two concepts. Thus, this work contributes to theoretical elaborations on managerial learning in social practice and creates perspectives for investigations about how the student communities complement the schooling of students who participate in them.

Keywords*— *Do, Situated learning, Social practice, To know.

I. INTRODUCTION

The importance of learning, in the context of teaching and research in Administration, inspired the proposal of this study, whose theme is the situated learning of managerial competencies in the social practice of a student community. The interest in this theme stems from the search for ways to improve the professional schooling of students in the functional disciplines of Administration, as in the case of the Production Management discipline, for example. Production management is, above all, a practical matter, dealing with real problems. In this discipline, productivity appears as a key issue to be clarified, as early as its introduction. Productivity is a basic measure of performance being measured in the production by the value of the results obtained (products) in relation to the costs, that is, in relation to the value of the inputs used (Krajewski, Ritzman, & Malhotra, 2009). To that extent, labor costs (wages) are of major importance, referring to a specific measure: labor productivity - a measure of production per person or hour worked. A requirement then placed on companies is to increase the value of the result in relation to the cost of labor. In this process, aiming optimize people's performance. The productivity challenge raises questions about the learning processes that underpin professional training.

Several authors affirm that the development of competences needs to be based on learning cultures, be they developed in the educational environment, or in the professional scope (Le Boterf, 2003; Antonello C. S., 2007; Zarifian, 2012; Abbad, 2013; Dias Junior, Moreira, Stosick, & Pereira, 2014). For this, it is recommended that educational tasks be not centered on teaching, but on learning practices (Fleury & Fleury, 2001; Antonello & Ruas, 2005; Dias, Becker, Dutra, Ruas, & Ghedine, 2013). This positioning is typical of the literature that emphasizes systemic and integrated perspectives for managerial learning. Such perspectives advocate policies and approaches that locate managerial schooling within its broad technical, social, political, and cultural context in business-related learning models, since they have the potential to assist Education as they contribute to the development of competencies for a future professional career (Antonello & Ruas, 2005; Clyde, 2015).

Practice, in turn, has been considered particularly relevant in the context of research and teaching. Regarding research, the need for studies that address learning practices is explored, exploring how they emerge in the process of human interaction and action (Antonacopoulou & Chiva, 2007). As far as teaching is concerned, the potentialities that the practice brings to traditional didactic approaches, which privilege the transmission of formal and conceptual knowledge of the various functional disciplines, are exalted. These approaches highlight, in our Western culture, the epistemological and institutional gap that separates the typical cognitive situation from action, from conceptual and analytical knowledge (Koike & Mattos, 2000). Such separation produces a break between "knowing" and "doing", obscuring the dynamics of the production of

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knowledge and its effects, producing an inertia based on knowing much and doing little, that is, on a gap between the "Knowing" and "doing" (Pfeffer & Sutton, 2001).

The focus on the interweaving between 'knowing' and 'doing' directed this study to the fact that in the so-called professional areas, such as Administration, Medicine and Engineering, scientific knowledge only makes sense when applied to practice, and different knowledges that contribute to professional development (Schommer, 2005). In these areas, practice, experience, action, rather than speculation, are essential in the production of knowledge. Theories, ideas and hypotheses are instruments that impel action, and these are true when they are useful and can be verified. The characteristic of the "professions" show that the "knowledge" produced in it requires usefulness, applicability. It is, therefore, a prescriptive "knowing" of what must be done, of how it should be done, of who has competence to do, and so on (Cavedon, 2014).

This result-oriented view, which is geared to doing things and finding solutions to problems, regardless of ideological and political differences, as well as understanding the meanings of phenomena in terms of their consequences, is characteristic of pragmatism. For this school of thought, ideas are only important if they serve as an instrument for solving real problems. John Dewey asserted that even philosophy should have practical utility in people's lives, helping them to intelligently solve everyday problems. For Dewey, the learning experience is reflexive, not just reproductive, resulting in new knowledge. To do so, the following aspects are essential: the learner must participate in true experimentation situations; the activity should be of interest to you; there must be a problem to be solved; he must possess the knowledge necessary to act in the face of the situation; he should have the chance to test his ideas. It is understood, therefore, that reflection and action are interconnected, being part of an indivisible whole (Elkjaer, 2013; Farjoun, Ansell & Boin, 2015).

Thus, to bridge the gap between "knowing" and "doing", another mode of learning that goes beyond formal classroom learning has been recommended. This other way includes experiencing real situations in the business world, in which the practice of student communities represent alternative forms of learning in action. Thus, arguing that the learning that occurs in the social practice of a student community promotes the interweaving of "knowing" to "doing", we ask in this article: how the situated learning of managerial competences that occurs in the social practice of a student community, contributes to the schooling of those who participate in it?

To answer this question a qualitative research was carried out in an Engineering Competition Team, where its practice was observed and people involved were interviewed. The result of this research demonstrated that the learning of managerial competences, which occurs in the practice of the team, transposes the limits of the formal learning of the classroom and is situated in a conjuncture of real situations of the business world. This process thus makes an important contribution to the academic schooling of the students who participate in it.

The presentation of the research results is organized into five sections, including this introduction. The second section shows how learning studies can benefit from a focus on social practices. In the third section, the research methodology is detailed, followed, in the fourth, of the research findings. The fifth section concludes with a discussion of the contributions to theoretical elaborations on learning and social practices and how such elaboration facilitates the filling of the epistemological and institutional gap between "knowing" and "doing."

II. THEORETICAL REFERENCE

The combination of theoretical content with real professional practice contexts seems to result in environments that are conducive to effective learning (Antonello & Ruas, 2005). According to Deiglmeier (2013), when students put the "hand in the mass", they understand that they will have to deal with successes and failures which act in favor of building their skills and consequent professional schooling.

Thus, the potential that the practice brings to the traditional didactic approaches, which privilege the transmission of formal and conceptual knowledge of the various functional disciplines of the Administration, is exalted. There is no denying that teaching strategies such as case studies, games and simulations are examples of didactic approaches that bring good educational results, since, by systematically articulating theory and practice, they construct rich opportunities for knowledge production. However, these approaches present deficiencies because they can not replace the everyday reality of managerial procedures (Antonello & Ruas, 2005). In addition, the isolation of the market, which characterizes Brazilian education, has been identified as one of those responsible for the very theoretical and impractical schooling students receive (Ramos, 2015). So another way of learning that goes beyond formal learning in the classroom has been recommended, although it is

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not yet defined which modality would allow the experience of real situations in the business world.

If, on the one hand, the importance of teaching methods based on practice is noted, on the other hand, it is observed that the notion of practice has also permeated the Administration's research agenda, most notably since the 1990s. Since then, authors such as Lave (1991), Easterby-Smith, Snell & Gherardi (1998), Nicolini, Gherardi & Yanow (2003), Antonacopoulou & Chiva (2007), Miettinen, Samra-Fredericks & Yanow), Bueger & Gadinger (2014), Krasny et al. (2017), Mccourt (2016), Lynch, Rowlands, Gale & Skourdoumbis (2017) and Grootenboer, Edwards-Groves & Choy (2017) highlight the need for studies that address learning practices, exploring how learning emerges in the process of action and human interaction. From the perspective of the research, learning is an object of research, as it means a specific theoretical field of organizational studies (Chiva & Alegre, 2005; Marshall, 2008; Versiani, Oribe & Rezende, 2013). In this field, situated learning (Lave & Wenger, 1991, Lave, 2013, Strati, 2014) is a theoretical direction or a specific perspective of learning studies based on epistemologies of practice (Brown & Duguid, 2001; Antonacopoulou, 2008; Corradi, Gherardi & Verzelloni, 2008, Bishop, 2013).

2.1 Situated Learning of Competencies and Social Practice

In the situated learning references (Lave, 1988, Didier & Lucena, 2008, Gudolle, Antonello & Flach, 2012) and in the studies on professional competences (Parry, 1996, Perrenoud, 1999, Le Boterf, 2003, Dutra, 2004, Zarifian, 2012, Chong, 2013, Dias Junior, Moreira, Stosick & Pereira, 2014), were found the conceptual set to base the theoretical composition of the research presented here. In addition, according to Freitas, Montezano and Odelius (2019), higher education institutions have sought to combine extracurricular activities with the theoretical knowledge produced in the academy. They aim to complement the theoretical content and promote economic and social development, as well as the advancement of science and technology (Freitas Jr, 2003). These activities often constitute opportunities for the development of management competencies, since they make possible a real contact with the organizational contexts and their complexities (Leite, 2009). Thus, with regard to the empirical object, it was observed that the student communities or, in this case, more specifically, the Engineering Competition Teams (ECTs) presented themselves as alternatives of learning to the traditional teaching situations. In ECTs, learning is always central and occurs as part of a process that places its members as active participants in their activities, not as formal and classroom learning, but as collaborative and practical learning. The perspective of practice explains social phenomena in a procedural way without losing touch with the mundane nature of everyday life and the concrete and material nature of the activities with which people are involved. In this perspective, knowledge is seen as a form of mastery that is expressed in the competence to perform a social and material activity. One learns how to act, how to speak (and what to say), how to feel, what to expect and what things mean in situations of practicing (Nicolini, 2013).

Learning is a complex, multidimensional and multilevel process, whereby individuals acquire new qualities that increase and transform their arsenal of competencies (Pereira, Loiola, & Gondim, 2016). People learn on their own initiative or through incentives from others, for example, by stimuli offered by organizations. Although it is an essentially individual act, all learning involves the integration of two very different processes: an external process, of interaction between the individual and his social, cultural and material environment, and an internal psychological process of elaboration and acquisition of new knowledge and abilities (Illeris, 2013; Pereira, Loiola, & Gondim, 2016).

Individual learning is defined as a process of building professional competences that cover the cognitive, emotional and social planes in which the learner plays an active role. Learning can be perceived in the observation of the performance of the individual, because while learning can be conceived as the process by which the individual acquires knowledge and skills, competence is the mobilization and relevant application of the knowledge and skills acquired to the particular situation and the performance is the visible manifestation of these competencies (Abbad, 2013, Pereira, Loiola, & Gondim, 2016).

In the literature on learning, the use of formal and informal learning is frequently used (Malcolm, Hodkonson, & Colley, 2003). According to these authors, there are elements of formal learning in informal learning situations, as well as elements of informality in formal learning, both of which are inextricably interrelated. In organizations, formal learning, although intentionally constructed, often presents an "experiential" character (Antonello, 2011).

Informal learning, in turn, is an activity that occurs outside the curricula of courses and educational programs and involves the pursuit of knowledge and / or skills. It may also occur in a formally structured experience, based on specific activities for this purpose, that is, it may occur

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in formal teaching processes, whether it is planned or not, as long as it involves some degree of awareness of what is being learned (Antonello , 2011). In their identification and evaluation, it is crucial that their contextual nature be considered, for example, in Lave and Wenger (1991), who consider that knowledge and skills, when acquired in social and concrete environments, result in a large part of participation in practices . From the social point of view, learning refers to how individuals interpret and / or attribute meaning to their experiences in practice, and considers them to be social beings, who learn collectively and who construct an understanding of the context around them (Lave & Wenger , 1991; Elkjaer, 2013). The transference of learning among individuals, in this work context, means the knowledge, skills, behaviors or attitudes they develop in practice (Veloso, Silva, Silva, & Caetano, 2015).

Therefore, in individual terms, learning in practice means acquiring knowledge and skills in an ongoing process of learning. Learning, in these terms, is not only reproduction, but also renewal and reformulation of knowledge and skills. Adopting this positioning, as well as identifying and seeking the integration between formal and informal learning, means broadening the possibilities of understanding the dynamic and complex process of learning in practice, in a more consistent and profound way.

Thus, situated learning is concerned with the study of mechanisms that contribute to the process of knowledge production, among them the development of professional competences. Professional competences are not restricted to a stock of theoretical knowledge embodied by individuals. Nor are they restricted to understanding the contents and dimensions of tasks (Fleury & Fleury, 2001). In this work, it is considered competence, as well as professionalism, as a set of related knowledge, skills and attitudes that affect performance in activities, by the knowledge, may, and feel like of individuals to act (Parry, 1996; Le Boterf, 2003).

This theoretical framework led to the research on the subject of learning in the practice of an Engineering Competition Team (ECT). ECTs are student communities that carry out the development of practical projects aimed at obtaining a product. The activities of these communities are driven by national and international competitions that comparatively evaluate the projects, putting to the test the knowledge, innovations and technologies developed by different teams. Examples of these competitions are those promoted by SAE Brasil (Society of Mobility Engineers), a non-profit association whose mission is to disseminate techniques and knowledge related to mobility technology in its various forms: terrestrial, maritime and aerospace. Student association programs aim to provide acquired knowledge and skills and attitudes are demonstrated when students are confronted with management and technology issues in practice that require knowledge, may, and feel like to act (SAE Brazil, 2015).

The word practical, in its broad sense, encompasses professional knowledge, forms of teaching, entry and socialization into a professional community, and the repetition of an acquired skill. Practice holds the opposite direction of theory, though it often brings the notion of being complementary to it. Professions use the expressions "practice-based studies" or "practice-based theory" to emphasize learning from the direct experience in which each professional community is founded. In turn, organizational literature uses the term practice to refer to a "recurrent way of doing things" and to learning that occurs in work practices.

The approach to practice explains social phenomena in a procedural way without losing touch with the mundane nature of everyday life and the concrete and material nature of the activities with which we are all involved. From the perspective of practice, knowledge is seen as a form of mastery that is expressed in the competence to perform a social and material activity. Knowledge is always a way of knowing shared with others, a set of practical methods acquired through learning (Nicolini, 2013).

Among the different views on the practice, one should highlight the one that has tried to develop new understandings about the relation between knowledge and practice from a non-rationalist and non-cognitivist perspective (Gherardi & Perrotta, 2014). In practice knowledge is no longer conceived as something possessed, neither as something pre-existent to action, nor as a substance to be applied when and where it is needed. Authors like Shotter (2012) and Gherardi and Perrotta (2014) have adopted an approach that considers knowledge to be an situated activity, that is, something that people do together while they are involved in everyday social practices, where the distinction between knowledge and the doing ceases to exist. Thus, situated learning that occurs in the social practice of the team interweaves "knowing" to "doing" in the competencies that develops and contributes to the professional formation of those who participate in it. Competence exceeds the knowledge (knowledge) that a person possesses, encompassing also their abilities, that is, the knowledge put into practice and the attitudes (wanting to do), which result from the sum of knowledge and skills

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(Neves, Carvalhinha, Muritiba, & Muritiba, 2017). Figure 1 summarizes and outlines this idea, representing the theoretical model that guided the empirical research presented in this paper:

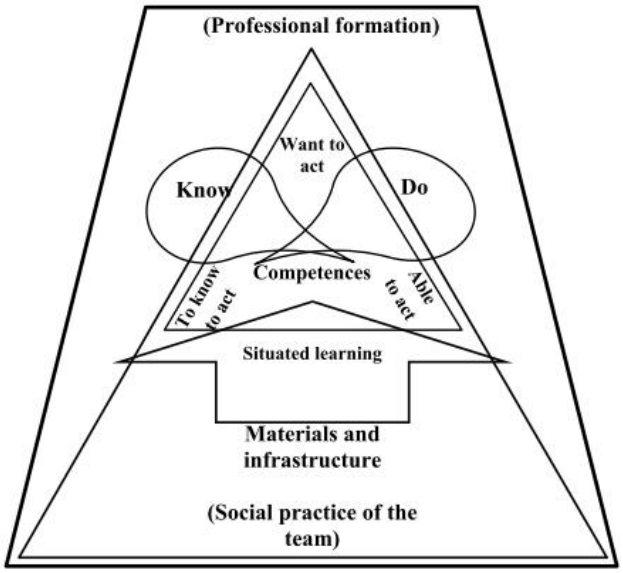

Fig.1: Theoretical model that guided this study.
Source: Own elaboration.

III. METHOD

This paper examined the social practice apprenticeship of an engineering competition team over a period of two years and three months. The focus on a single team is appropriate, since a good case study using the practice approach requires observational guidance and the adoption of methods that allow an appreciation of the practice as it happens (Nicolini, 2013). The team studied participates in the Baja SAE project (SAE Brazil, 2015), which is part of a student training program in which engineering students spontaneously organize teams to design and build small off-road cars. They compete representing their educational institution nationally and internationally. The idea of this program is that students apply, in practice, the knowledge acquired in the classroom and, in addition to complying with the requirements of the regulations of the competitions, innovate and undertake, differing positively from the other teams. By participating in the Baja SAE project the student becomes involved with a real case of developing a vehicle.

The team was formed at the end of 2011 by a group of students from a Federal University of the State of Minas Gerais - Brazil. The team consists of students from the Science and Technology and Mechanical Engineering courses. The total number of students participating in the team is around twenty-two. They are led by a student, designated as captain, and coordinated by a guest teacher. The team is divided into two main sectors: management, and vehicle development. The management sector is composed of three departments: Finance, Marketing and Human Resources. The development sector of the vehicle, in turn, is composed of six departments, with a responsible director each: Suspension, Electronics, Steering, Structure, Transmission and Braking. Each director is responsible for the division of tasks in his department and for the presentation of the results obtained, the other directors, the captain and the coordinator.

3.1 Data collect

Three sources of evidence were used in the research: a) participant observations, synthesized in field journals written in notes and audios; b) photographs and; c) individual interviews in depth, semi-structured, recorded and transcribed. Participant observation was chosen because it is a modality of observation in which the researcher is not simply a passive observer, being able to assume several roles in the experience with the team and actually participate in the events that are being studied. Thus, during alternating periods, sixty visits were made to the team. In addition, one of the researchers accompanied the team in one of the competitions held in Piracicaba / SP. Records of the observations were recorded and annotated. After leaving the site, the observations were reported in the so-called "field diary", made in a text file on the computer. Sixty field diaries were thus obtained.

The photographs present an essential element in the analysis of the meanings constructed, inculcated and transmitted by the social environment. The analysis of the observer goes through a process of negotiation of meaning that transcends the image itself and can be read as a text and pointed as an objective record and testimony, a copy or a faithful transcription of a moment of reality. In this way photography is a process of legitimate abstraction of observation, since it transforms common data into circumstances for the elaboration of the analysis in the research (Almeida, 2007). In this work, eighty-seven photographs were used. They sought to capture the details of the learning aspects associated with community practice. The images seek to capture and transmit what is not very efficient on the linguistic plane, such as the distinction between situations where prevails the "knowing" (studying, designing, etc.), or the "doing" (sanding, cutting, mounting etc.) Thus, the photographs showed community-based learning. In it, team members appear to be studying vehicle systems (knowing); sanding the vehicle fairing, twisting and cutting steel tubes (do) and; designing and assembling the vehicle, activities

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involving knowing, willing and able to act and requiring knowledge, skills and attitudes.

The in-depth, semi-structured interviews were adopted as the third source of evidence because they contain characteristics that make them appropriate to the situation, such as the fact that they can be opened and take a conversational way, allowing unpublished comments. The interviews included directors, the captain, the coordinator and current members, as well as some founding members who are no longer on the team. In addition, we interviewed the current ICT director and deputy director, the team leader at the time of the team's inception, current team coordinator, and current mechanical engineering course coordinator, totaling nineteen interviews. The interviews were carried out in person using a tape recorder. It is noteworthy that, both with respect to the observation and the interviews, an iterative process of advances and returns between the empirical data and the emerging analyzes occurred, making the data collection progressively more focused and the analyzes successively more theoretical (Pinto & Santos, 2012).

3.2 Data analysis

The analysis of the data was based on content analysis, the technique of which is to classify the different elements into "drawers", according to criteria that could give rise to a sense and introduce some order in the initial confusion. Specifically, content analysis is a set of methodological tools that, through objective and systematic procedures, describe the content of extremely varied communications messages (Nodari, Soares, Wiedenhoft, & Oliveira, 2014).

Following the recommendations of the literature (Gray, 2012; Nodari, Soares, Wiedenhoft & Oliveira, 2014), we sought to understand and interpret each unit decomposed from the original message. In this way, each unit of analysis could be constituted as much of words and subjects as of objects, individuals or events. This choice helped to verify the frequency of certain terms or topics and facilitated the identification of the content and characteristics of the information present in the text. The analysis was divided into two phases:

1) A pre-analysis was carried out by means of a floating reading of the material, the choice of the documents to be analyzed, the preparation of the indicators that would support the interpretation, and the preparation and organization of the material;

2) It was then moved to the exploration and codification phase of the material. Using the semantic classification criterion, which is constituted by thematic categories, the coding was performed in three stages: open coding, axial coding and selective coding.

Open coding sought to express data and phenomena in the form of concepts, through the production of a list of codes and categories, with the aim of elaborating a more detailed understanding of the text. Axial coding has improved and differentiated categories from open coding, resulting in the following categories: knowing, doing, learning and academic schooling. In the selective coding the essential category was elaborated around which the other categories were developed and grouped, giving continuity to the axial codification in a higher level of abstraction. In this work the essential category was learning.

The MAXQDA software (VERBI GmbH, 2017) was used for the exploration and coding of the material. MAXQDA is a professional software for analyzing qualitative data and mixed methods of investigation, which assists the analysis of all types of unstructured data, such as interviews, scientific articles, multimedia files, questionnaires, social networking data, among many others possibilities. The software also allows you to encode audio and video files directly, without having to create a transcript, or transcribe the multimedia files and then perform an analysis of the text, as done in this work with interviews, recordings of meetings and recordings of the field diary observations. MAXQDA also allows quantifying the results of qualitative analyzes and calculating statistical frequencies in a simple and direct way (VERBI GmbH, 2017).

IV. RESULTS

In order to understand how the learning, which occurs in the practice of a ECT, contributes to the professional formation of the students participating in it, it was sought to detect in the data the alignment between the situated learning and the consequent contribution to the professional formation required by the Marketplace. It was noted that such alignment results from a relationship between the situated learning and the professional formation that, in the ECT, happens in the interweaving of knowledge when doing that occurs in the professional competences that are developed by the learning.

Then, taking the model formulated to base this study (Figure 1), the memories of the coexistence with the team and the data contained in the documents (diaries, photographs and interviews), was set up the process that shows how the situated learning that occurs in the practice of ECT results in the development of competences in its participants. Thus, the search for knowledge, individually or collectively, unrelated to

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doing, implies learning that results in that portion of knowledge that, in the model represented in figure 1, lies in the gap between the triangle that represents the competences in development and the larger triangle, which represents the practice of the team. Although it is imbued with meaning, it is devoid of doing. It, like formal classroom learning, does not develop competences.

Those who have taken over the model (Figure 1) seeking an understanding of what is being treated, will have noticed that there is still a part of the knowledge that is outside the triangle that represents the practice of the team, although it happens in ECT, and will question what that means. It turns out that ECT is also a collective space, used by its members to study and perform the extra room tasks required by the university's formal education. That portion of knowledge results, then, from a learning that, although it is part of the academic formation, is not directly related to the practice of the team, and does not result in the development of competence.

As in the process of knowledge acquisition, the development of skills also follows the same logic. It can be seen in the model (Figure 1) that there is a part of the doing done in the ECT, which is outside its practice. This doing represents those activities carried out in that collective space, which are not directly linked to the activities of the team. This is the case, for example, of the use of materials and the infrastructure of the team for practical classes, carried out by some teachers. In addition, one realizes a part of doing that, although it is imbued with meaning (who does know why and for what it is being done), this doing does not develop skills. This is represented in the model by the space between community practice and developing competences.

Therefore, it is only when shared actions involving acquired knowledge, developed skills and positive attitudes occur to what is presented as something necessary to the functioning and / or the production of the team is that a learning situation occurs in the practice of the same. It is in this sharing (language, communication) of ideas and meanings that new ideas are generated, new meanings are created and the understanding of things is broadened. This knowledge, when intertwined with a task that requires previous skills and simultaneously develops new skills, with the process being moved by proactive attitudes, develops competences and contributes significantly to the professional formation of the participants.

MAXQDA software (VERBI GmbH, 2017) provided a detailed numerical description of the results obtained in each of the categories. Two examples of this description seek to synthesize the results achieved. Table 1 shows the relationships between the categories and their respective sources of evidence:

Table 1: Overview of results

Categories / Sources	"Know"	"Do"	Learning	Academic formation	TOTAL
Field Diary	29	31	32	32	**124**
Photos	79	82	84	84	**329**
Interviews	28	22	45	45	**140**
TOTAL	**136**	**135**	**161**	**161**	**593**

Table 1 shows that, of the five hundred and ninety-three segments extracted from the sources of evidence and considered as categories in this study, one hundred and twenty-four are from the field journals, three hundred and twenty-nine are from the photographs and one hundred and forty are from interviews. One hundred and thirty-six belong to the category "Knowing", one hundred and thirty-five to "Doing", one hundred and sixty-one to learning and the same number to academic formation.

Table 2: Connections between codes

Categorias	"Know"	"Do"	Learning	Academic formation	TOTAL
"Know"	0	129	136	136	**401**
"Do"	129	0	135	135	**399**
Learning	136	135	0	161	**432**
Academic formation	136	135	161	0	**432**
TOTAL	**401**	**399**	**432**	**432**	**1664**

Table 2, in turn, shows the connections between the categories. By analyzing the two tables together, it is possible to deduce that, out of one hundred and sixty-one segments of the "Learning" category (Table 1), all are connected to the category "Academic formation", one hundred and thirty-six are connected to the "Knowing" and one hundred and thirty-five to "Doing" (Table 2). The interlacing between "Knowing" and "Doing" is also noted. Of the hundred and thirty-six segments extracted from the "Know" category, and the hundred and thirty-five segments of the "Do" category, one hundred twenty-nine appear connected.

V. FINAL CONSIDERATIONS

Problem solving is at the core of engineering practice and the technical work of engineers is inseparably interwoven with collaboration between team members (Passow & Passow, 2017). In this sense, besides the

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specific technical competences, the current labor market has demanded, from the engineers, competences that contribute with the capacity to solve problems and to create products. It requires not only the enhancement of technology knowledge, but also the understanding of how modern business organizations function. An example of this is the knowledge requirements related to financial, marketing, legal and, above all, people (Hecklau, Galeitzke, Flachs, & Kohl, 2016). According to a study conducted by the United Nations Educational, Scientific and Cultural Organization - UNESCO (2010), an engineer able to meet the challenges of the 21st century must have the following competencies: entrepreneurship, flexibility, ability to contribute to innovation, creativity, ability to deal with uncertainties, a sense of continued learning, social and cultural sensitivity, ability to communicate effectively, to work as a team and to take on new responsibilities. Among the important competences for engineering practice, teamwork is considered a transversal competence, a central topic of the knowledge and skills required (Sein-Echaluce & García-Peñalvo, 2016; Passow & Passow, 2017). These managerial competencies are objects of study, research and teaching in the Administration field, and are not included in the curriculum of most engineering courses in Brazil, with severe resistance from both teachers and students, as well as the incorporation of new activities, outside the so-called technical competencies (Confederação Nacional da Indústria, 2015). According to Passow and Passow (2017), teachers should jointly articulate and prioritize the competences that students must obtain in their formation, to prepare for life and career. The authors also argue that when faculty creates the specifications for creating a curriculum, they need to answer questions such as: "Among generic engineering competences, what is the importance of professional practice in disciplines and work contexts?".

In the professional field of engineering has been emphasized the importance of the development of managerial knowledge. The perceived shortage of qualified engineers in Brazil is aggravated, as the business sector expects these professionals to present personal skills that surpass traditional objective and quantitative reasoning. In this sense, students are expected to develop leadership characteristics and teamwork, entrepreneurship and general knowledge, whose dominance has been increasingly important for the schooling of the entrepreneurial and innovative engineer (Confederação Nacional da Indústria, 2015). The need for appropriate educational components to generate a "pre-work experience", linking the teaching activity to business and the industrial environment is perceived (Ríos-Carmenado, López, & García, 2015). This need can be seen in the federal government's educational guidelines put to Engineering schools, which have been advised to improve the training of their students. This orientation is found in the "National Engineering Plan (Pro-Engineering): Brazilian Development - Winning the Challenges of the Decade 2011/2020" launched in September 2011 by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES-MEC, 2011) . This plan, when presenting a detailed diagnosis of the schooling of engineers in Brazil, confirms the need to improve the teaching quality of this profession, prioritizing educational actions focused on solving concrete problems. One of the proposals of the plan is the implementation of innovation projects in schools so that the students have contact with the practice at the beginning of the course (Carneiro Júnior, 2010). Therefore, the main purpose of current engineering schooling should be to shift the focus from logical thinking (cartesian) to creative thinking, less theoretical and more experimental, less abstract and more concrete, emphasizing the competences empowerment of students.

It can be noticed that Engineering schooling in Brazil does not privilege the development of management competences and is still very focused on content with little contact with the "real world". There is, in Brazil, a chronic and widespread problem when it comes to laboratories that deal with real problems and that go beyond mere demonstrations or analysis of errors. Little attention is given to scientific results that can solve real problems. Students complain about the low relationship between theoretical and practical experience. Engineering schooling does not interweave the fundamental concepts of science and mathematics with the practice of the future profession. Students do not learn content from other areas that use methodologies other than operational and numerical in modeling, are not called attention to the application of scientific concepts in the possible use in future innovations and are not faced with practical challenges and environments that reproduce what they will find in industries. Therefore, the great challenge identified in the teaching of engineering in Brazil has been to train competent engineers in both their technical and managerial areas, stimulating proposals in which practice has a relevant role.

The connections between the categories analyzed in this study point to the fact that learning, which occurs in the practice of the community investigated, contributes to the academic formation of the students participating in it, developing the competences required by the market, and

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providing the interweaving of the "Know" to "Do". No studies were found addressing the issue of learning in the practice of an ECT and, especially, studies in this type of student community, which deal with how this process contributes to the fulfillment of the epistemological and institutional gap that separates the conceptual and analytical knowledge of the situation cognitive model of action (Koike & Mattos, 2000). In other words, no work was found in this type of organization dealing with how this process contributes to filling the gap between "knowing" and "doing" (Pfeffer & Sutton, 2001). Therefore, we consider that addressing this gap, in the context of an ECT, is relevant in debates about learning and development of managerial competences in the formation of students who participate in them, as well as in other student communities. In comparison with other forms of learning, what happens in a community requires that its participants know how to do and what they do, and thus constitute a form of acquisition of knowledge and skills of strategic importance for the formation of students from the so-called "professional" areas.

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