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COMPETENCIES IN DESIGN EDUCATION

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ABSTRACT

Theoretical foundations of competencies show different approaches to this construct. From the perspective of Business (PRAHALAD, HAMEL, 1990; FLEURY, FLEURY, 2001; RUAS, 2005) and Education (DOLZ; OLLAGNIER, 2004; DEMO, 2010; PERRENOUD, 1999) designers competencies can be explained. But how are those notions developed in design education? This paper presents a framework of competencies developed by students in product design undergraduate courses. Based on a two-step qualitative research, where the desk research gave foundations for identifying designers competencies and in-depth interviews gave expert's perspectives on the research questions, the framework developed reflects how professors deal with competencies considering knowledge as explicit and tacit knowledge, ability as a double concept meaning manual and mental ability, and attitude as intrapersonal and interpersonal skills. The results show six main competencies to be developed in design education: graphical representation, modeling, oral expression, teamwork, empathy, and autonomy. This paper discusses its characteristics and how these are developed by professors and students throughout Design Product courses in undergraduate.

Keywords: Design Education, Product Design, Competences in Design

1 INTRODUCTION

The investigation about the Design education is a focus of many authors, who deal with different issues (MEDEIROS; NAVEIRO, 2002; MEDEIROS, 2002). In Brazil, it is clear that this theme is mostly handled from the classroom report experiences (AIEX; SANTOS, 2006; REMUS; MARQUES, 2008; ALMEIDA, 2010), having little reports relating work in the classroom with real projects or partnerships with companies.

In Brazil, there are curriculum guidelines (BRASIL, 2003) which give directions to the Design undergraduate courses in curriculum structuring. Thus, institutions follow these guidelines to prepare their courses and classes, being a guide to organize their programs. In the Design Undergraduate Course National Curriculum Guidelines (BRASIL, 2003), the article 4th explains that the Design undergraduate course must allow an academic training which reveals competencies and abilities. It is noticeable that the notion of competence is listed in the Undergraduate Design Course Curriculum Guidelines, addressing its usage in a general way.

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Competences in Design Education

Vinicius Silveira Martins, Fabiane Wolff

Medeiros and Naveiro (2002) argue that the pedagogical matters concerning project teaching are still poorly understood. The authors comment that the foundations and principles of project teaching are still superficially known. In this context, Pereira (2007) argues that, in terms of research results of Design teaching (monographs, dissertations and thesis), the pieces of information provided are not enough and not updated. According to the author, a survey would be necessary to generate a global view of the academic production in Design education.

This paper fills the gaps observed by Medeiros and Naveiro (2002), contributing to the matter of Design teaching, from the notion of competence and its dimensions. Medeiros and Naveiro (2002) relate, from a survey with Mechanical Engineering undergraduate students, that they have their necessary competences to the project activities. Thus, this study presents a framework of competencies developed by undergraduate students in product design courses.

2 METHOD

To reach the previously purposed objectives, the following steps were taken: revision of the concept of competence and in-depth interviews with five Product Project professors from a Design School in Brazil.

Qualitative research was used which, according to Flick (2009), is relevant to social relations study. The purpose of this kind of approach is to understand the phenomena from the people's representation of life. Data was collected through in-depth interviews, which, according to Malhotra (2012), are straightforward, personal, and people are interviewed individually. The study frame focuses on the matters of undergraduate education, mainly on the Product Project subjects. These boundaries are related to the practical and didactical importance of the Project subjects to Design teaching, whether referring to Graphic, Fashion or Product Design.

To the interview step, the audio was recorded and the interviews were transcribed. Thus, it was possible to understand the speeches and the relations between professors and Product Project subjects.

For the further analysis of the interviews, the collected material was categorized. After this step was given, the speech given by the professors, were discussed according to the theoretical basis and the categories presented in the interviews.

3 CONCEPS OF COMPETENCE AND ITS APPLICATIONS IN PRODUCT DESIGN TEACHING

The notion of competence, as a study of interest, is organized and researched in two levels, not restricted, which can contribute to this study, which are: individual and organizational (PRAHALAD; HAMEL, 1990; PERRENOUD, 1999; FLEURY; FLEURY, 2001).

It is considered relevant to observe the authors' perspectives when dealing with the individual and organizational levels. Essentially, the competence notion is

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related to mobilization and combination of capacities (resources) in a limited context (RUAS, 2005). Thus, the point which identifies competence is the kinds of resources used and the objective or situation in which this concept will be used. (FLEURY; FLEURY, 2001; RUAS, 2005; ZARIFIAN, 2008).

Aiming to relate the values for the individual and the company Fleury and Fleury (2001) show the concept of competence as a know-and-act, which results in the mobilization, integration and transfer of knowledge, resources and abilities, adding economic and strategic value to the company and social value to the individual. It is noticeable the importance given to the company, emphasizing the Business view over this concept.

In the field of education, doubts about competence definition and the conflicting relation to the theoretical body are similar to those that occur in Business Schools. Even so, the notion of this term under other point of view can give resources to its application in Design. "In a first really general glimpse, the notion of competence directs the capacity of producing a conduct in a certain domain" (DOLZ; OLLAGNIER, 2004, p. 10). The authors argue that the use of the term competence in the education field provokes some uncertain thoughts, due to the difficulty of clearly identifying the phenomena it tries to achieve. As for its applicability, Demo (2010) comments that the competence/ability implicates in the combination between analysis and intervention. The analysis deals with organizing the complexities and understandings of the involved, aiming to find something simpler and manageable. The intervention relates to problem solving from theoretical hypothesis.

Dolz and Ollagnier (2004) explain that the notion of competence in education can be related as a means of professional formation. Thus, its definition uses a vocabulary from the business context. On the other hand, in the business context, the approach of the competences questions the professions, the professional acknowledgments, and the content of the activities. Bonding the professional formation, the competences of the education field allow a relation between educational institutions and the business context.

From the notion of competence provided by Ruas (2005), which characterizes this concept as a mobilization of knowledge, abilities and attitudes, each item is unfolded, considering knowledge as tacit and explicit; manual and mental ability; interpersonal and intrapersonal attitude (figure 1).

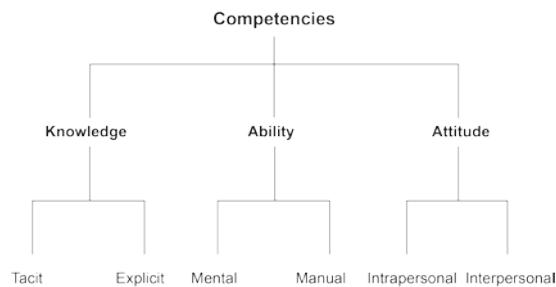


Figure 1- Notion of competence

In this way, Nonaka and Takeuchi (1997) present the knowledge in two ways: tacit and explicit. The first is about practical knowledge, which is not coded in books or other resources, being hard to transmit and articulate. And the second, which is more easily transmitted and can be coded through books or manuals.

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The abilities have been explained by Orborn (1972), who relates them with the cognition (senses), retention (memory), evaluation (analysis) and creation (product). On the other hand, Gomes et al. (2010) and Medeiros (2002) approach graphical representations as a means that helps the project activity. Other manual activity is the prototypes construction, which can be used to validate, compare and share the generated alternatives (YANG; EPSTEIN, 2005; SASS; OXMAN, 2006; COUGHLAN; SURI; CANALES, 2007). Lastly, the attitudes, which are linked to the concepts of intrapersonal and interpersonal intelligences (GARDNER, 1995). The first is about the inner matters of people and their ways of orienting random situations. The second deals with the relations with the teams and the collective work situation.

4 RESULTS AND DISCUSSION

The interviews with the Product Project professors were very important to the understanding of the use of the concept of competences in the classroom. Through the approach developed by a semi-structured script, which has a theory-based foundation, the relation practice was discovered and it was possible to identify five competences, as shown in this discussion.

About the concept of competence that the professors report, it is possible to relate the matter of ability as something operational and the competence as a result from what the students can achieve or what they are capable of doing. Some points were exemplified by the interviewees, showing many aspects that the students needs to develop, as the ones related to knowing how to draw, knowing how to stand for their project, teamwork, understanding the whole picture of the project, knowing how to relate to people, knowing how to understand the research date or observations and knowing how to work with project restrictions.

Given these fundamental points, from the analysis of the data it was possible to notice the competencies worked in the Product Project course. These, compared to the theory, result in five identified competences, as it follows: (i) graphical representation (manual, digital and technical) and modeling (mock-up and 3-D models); (ii) oral expression (project presentation/selling); (iii) teamwork; (iv) empathy; and (v) autonomy (knowing how to search for information).

To the mobilization of the modeling and graphical representation competence (figure 2), the students must have the knowledge and ability to represent their ideas through manual drawings, as mentioned by Marzal et al. (2013). This way, drawing is also used as means of observation, analysis and creation, according to Suwa and Tversky (1997). The capacity of evaluating the alternatives is made through the construction of tridimensional models (YANG; EPSTEIN, 2005; SASS; OXMAN, 2006; COUGHLAN; SURI; CANALES, 2007). The attitude, in turn, is exemplified in the communication and idea sharing ability with the classmates, professors and project teams through drawings and models (YANG; EPSTEIN, 2005).

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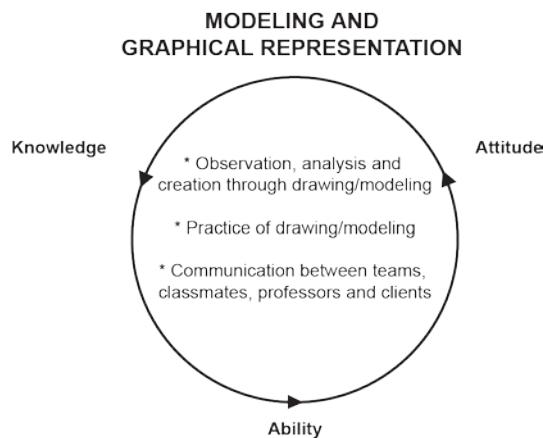


Figure 2 - Modeling and graphical representation competence

The competence of graphical representation and modeling is developed from the professors' requirements through handing in manual, technical and models drawings. Modeling is a resource the students use to validate their drawings made and it is also asked by the professors during the semester. These two points are part of the evaluation in the Product Project subjects, showing the importance of the competences mentioned previously. In its tacit knowledge dimension, this competence is worked through some short initial exercises and the partial and final deliveries of the semester. The mental ability dimension is shown through using modeling (mock-up and 3-D models) as a way of evaluating the manual drawings and the alternatives purposed. The manual ability dimension characterizes this competence, as for the visualization of alternatives. The intrapersonal attitude dimension refers to interpretation, analysis and understanding of the project problem. The interpersonal attitude dimension deals with the communication between teams, classmates, professors, clients, among others. Thus, Stancey, Eckert and McFadzean (1999) point that the drawings used to communicate are different from the ones used in project activities because the one who interprets the drawings does not know the intention of the drawer. The interpersonal dimension can also be identified in the project presentation, as well as graphic matters and the tridimensional models.

The oral expression competence (figure 3) is developed from the students' ability to communicate, either orally as graphically. Manual drawing and model construction are ways by which designers can share ideas (YANG; EPSTEIN, 2005). The necessary abilities deal with the kind of language used and the way of using them, either through a classroom presentation or a project presentation for clients. The attitude lies in the ability to communicate, aiming to know how to expose ideas to other people. Thus, the competence of oral expression embodies visual and linguistic abilities, which, according to Ulusoy (1999), are two abilities that embody Design.

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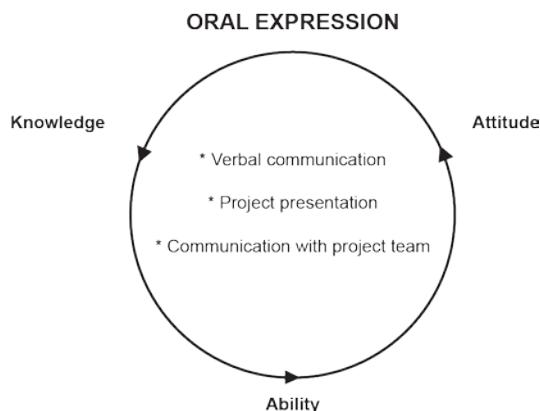


Figure 3 - Oral expression competence

The oral expression competence is about communication, whether for clients, professors or classmates. Professors work this competence through presentations during the semester, asking the students to show how they performed the project or special presentations for the partners of the subject. This last kind of presentation has a different profile, in which the students present as if they were selling the product. Project presentations are worth so that the professor can evaluate the ongoing of the project and can help students solving issues. About this point, Bussueri and Palmer (2000) argue that evaluating the performance of the teams during the tasks of the project improves the way they work. The explicit knowledge dimension related to the oral expression competence is not handled in the curriculum, as commented by interviewee "D". The main practices to develop this competence are some classes showing how the students should present their products. So, the students practice these presentations throughout the semester, and these are one of the evaluation steps of the Product Project subject. The mental ability dimension is worked when students need to speak up for their projects to professors or partners; situations in which students must have the capability of evaluating positive parts of their products, showing orally or through a graphic presentations, which include tridimensional models and two-dimensional drawings. The intrapersonal and interpersonal attitude dimensions deal with, respectively, the students' language and communication with clients, professors and classmates.

The teamwork competence (figure 4) is shown in the capacity the students have to deal with and to communicate with other people, both graphically and orally. Knowing how to manage and deal with the team conflicts, as ideas brainstorm point of view or as results evaluation. Having the ability of collect and share information with the team and the attitude towards understanding and analyzing the problems. Busseri and Palmer (2000) also contributed to teamwork, saying that the communication of a team in meetings and with people outside the project is important, as long as managing conflicts. These are the exactly the points the students must use in the classroom and in the professional practice, which the professors reported as topics studied in the Product Project subject.

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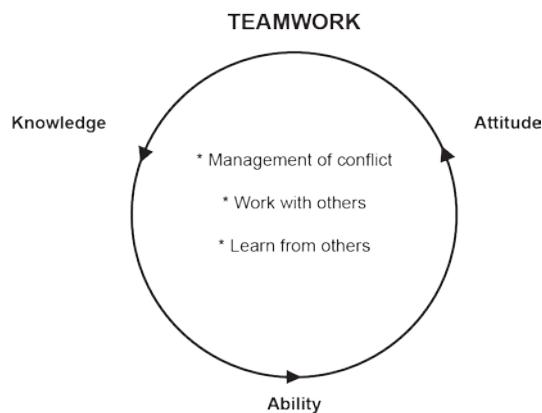


Figure 4 - Teamwork competence

The teamwork competence is developed through papers in pairs or groups. Practicing the union of many students to start a project has a connection with the professional practice, in which Designers will hardly ever work by themselves, as related by interviewee "D". Tacit knowledge dimension shows the involvement of students when in group, and this fact helps the conflict management that the professional may face in the market. The mental ability dimension is present in learning with other classmate and in the possibility of developing the product with a team formed by different individuals. The manual ability dimension is related to the graphical representation competence and modeling, in which the students must communicate with the group through drawings or models. In the sense of competences relations, the intrapersonal attitude dimension relates to the oral expression competence, in which the communication among the groups, subject partners and professors is fundamental. Last, the interpersonal dimension, which characterizes all the context of the teamwork competence, as much as conflict management questions as graphical and oral communications.

The empathy competence (figure 5) is recognized through knowledge of methodology and techniques used to solve the project. Hence, the abilities of observing, information and users interpreting are also part of this competence. Cross and Cross (1995) state that the project methodology has to deal with the integration among teamwork, technical processes and cognitive processes. In order to enable students to observe, analyze and interpret the context of the project, tools are necessary to this task and are shown through graphical representation, tridimensional modeling and analytical techniques. Contributing to the relation between the steps of the project, Günther and Ehrlenspiel (1999) argue that Designers without academic education focus in minor problems, while Designers with academic education prioritize the steps of the project. This fact collaborates to the project professors' view, when they approach many different ways in which methodology can be used in product development.

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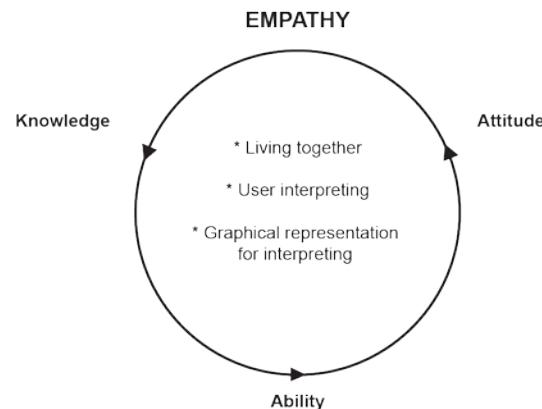


Figure 5 - Empathy competence

The empathy competence is developed through living with people, with the perception of how they interact with objects and their own relation with classmates, clients and professors. The explicit dimension is developed with the usage of methodology, procedures and analytic techniques. The tacit dimension lays in the project practice, research and in-loco observation of the students. The mental ability dimension is observed in the data interpretation and its connections with the objectives proposed in the project. On that account, to be able to observe, analyze and interpret, the manual ability dimension is put into practice from the drawings and models, providing registry and the data communication. The intrapersonal and interpersonal dimensions are present in the companionship with other people, either in the users' observations, teamwork or in the classroom.

The autonomy competence (figure 6) deals with the knowledge of generating and finding information necessary to solve the project. The abilities deal with the day in which the students own the collected information and use them in the project. Lastly, the attitude, which is the capacity of learning with this collected information. Lee (2009) highlights that the role of the professor, in the independent investigation method identified through the study about the kinds of projects, relates to supervisor or personnel. Professors give little support to the students in this approach. Thus, the students have autonomy to run their projects, resulting self-reflection and self-directedness during the product development.

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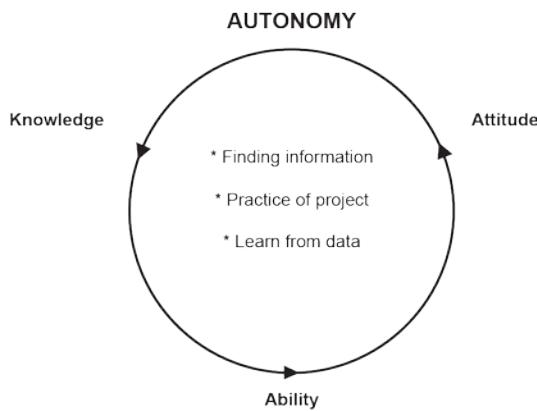


Figure 6 - Autonomy competence

The autonomy competence is developed with the management and search for information by the students. The explicit dimension is shown in the context, in which the students must search for information in literature and other resources. The tacit dimension is developed in the project practice, and, in this context, the students who will face a lack of knowledge about the project. The mental ability dimension is in the interpretation of information and in the connection with the objective of the project. The intrapersonal dimension also relates to the search for information, and is complemented with the interpersonal dimension, which deals with learning from the collected information.

5 CONCLUSION

This paper investigated the developed competencies in Product Project subjects, as it follows: (i) graphical representation and modeling; (ii) oral expression; (iii) teamwork; (iv) empathy; and (v) autonomy.

The competences were organized based on interviews with five Product Project professors. Thus, it is understood that there are other competencies, but they were not mentioned by the professors. Therefore, other factors related to the Design, such as creativity, abductive thinking, design thinking, and others were not addressed in this paper.

It is clear the professors' point of view concerning the competences, considering that other disciplines should develop the competences to be applied in the Product Project course. In this way, the Product Project course would only be responsible for developing a product. In this situation, professors reported that they should plan some classes to make up for this incomplete knowledge.

Regarding the limitations, this paper considered the competences from the view of the Product Project subject professors; on this way, the students, market and other subjects from the curriculum were not considered in this issue. Other

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