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# Design and Statement: The Understanding of 'Sustainability' in a Design Learning Activity

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## ABSTRACT

According to the activity theory, design students plan, realize and describe the tasks they have to perform. This process is a specific way of expressing their design learning process, within the curriculum in which they are interacting. The curriculum contents are discussed within the Pedagogical Contents Knowledge (PCK) framework to improve the teachers' methods. Sustainable development (SD) should be treated as a priority in the specific Technological Pedagogical Contents Knowledge (TPACK) research, since SD is a technical and social issue.

In this paper we study the methods used in two Masters of Arts courses to teach SD. The design students' statements are psychologically and semiotically analysed. Examination of the students' verbal and non-verbal utterances or iconic and non-iconic signs show hesitant, diverse and weak-structured statements.

Numerous indecisions emphasize their contradictory conceptions of SD. The lack of SD specifications in the syllabi opens a wide space of discursive perceptivity, in which students build their own design idiolect. They acquire design skills and abilities challenging the design PCK.

In this way, we can use these skills and the students' understanding of SD to develop the TPACK. In comparison to previous studies on SD learning, this paper emphasizes the need for combining these approaches to structure 'design didactics'.

**Keywords:** design statement, design activity, design abilities, sustainable development

## INTRODUCTION

The design activities of teaching and learning are examined in this paper according to the activity theory. This involves the analysis of the ordered, planned, situated, verbalised interactive and completed tasks the students perform to model an artifact (Lebahar, 2007; Kaptelinin & Nardi, 2009). In a further theoretical framework, the PCK approach, specifically the TPACK, allows us to better understand the design learning context, such as the curriculum organization and teaching methods (Williams & Lockley, 2012). In other terms, 'didactics', which in French corresponds to the teaching and learning process in the context of a classroom, in which the teachers give tasks to the pupils who have then to organize how they will act in order to complete each task (De Vries, 2008; Ginestié, 2009).

The 'design didactics' could be structured through examination of the students' and teachers' activities, i.e. how the students organize the specified tasks and how they socially interact using

‘verbal modelling techniques’ (Trebell, 2010). Thus, from a semiotics point of view, the statement or the ‘enunciation’ is the event underlying utterances produced by a speaker (Jakobson & Halle (1956, p. 58). When they are involved in a design activity, as ‘semiologically conscious designers’ (Wolf, 2011), students enunciate the tasks the teachers require them to do. They have to communicate as clearly as possible their design plan (Baldwin, Austin & Waskett, 2009). They attempt to reduce a type of uncertainty in the design process (Lebahar, 2007) to achieve a ‘pertinence’ or a ‘relevant message’, i.e. the progressive elimination of the signifiers which perturb the utterances’ understanding (Sonesson, 2006). The ‘relevant message’ is a ‘rhetorical design’ (Newcomb, 2012) which leads the learners to use a design ‘idiolect’, a ‘private code’ (Eco, 1979) with the aim of\_“greater efficiency in cognition” (Wharton, 2013, p. 249).

In a way, when they are uttering verbal or non-verbal statements, the design students are learning. However, the question is also what are they learning about SD in a design MA. Generally, the main concepts in the SD field are based on three criteria (ethics, technological fixes and social interaction) supported by three theoretical approaches (Keitsch, 2012):

- the social and training dimension (Papanek, 1984; Ramirez, 2012);
- the Design for Environment process (Baeriswyl & Eppinger, 2011);
- the organic vision of methodologies, tools and strategies for the integration of environmental requirements into product development (Vezzoli & Manzini, 2008).

In these three theoretical approaches the learning dimension is a significant issue.

No one studying sustainability in the design learning field is looking at the impact of SD in the student statements within the activity theory or TPACK frameworks. On the one hand, some studies present examples of transposition between integrated systems design, based on ecological principles, and learning situations emphasizing the positive impacts of the three previous criteria towards more sustainable ways of living and working (Birkeland, 2002; Fuad-Luke, 2009). On the other hand, some studies illustrate methods in which education in SD can be addressed through technological education focusing on creativity and skills (Pavlova, 2006, Stables, 2009).

### **WORKING HYPOTHESIS**

One of the features of design, is that it is a ‘rhetorical activity’, since designers’ statements are manifold and have a variety of artifact meanings, i.e. “Design and rhetoric are inextricably intertwined, and both are about action and ‘creation’ in the world” (Newcomb, 2012, p. 599). Thus, the design learning process could be considered as a structured thinking in design, in which the dialogues take a pivotal role (Tortochot, 2012) between the student and

- himself,
- the other students involved (or not) in the designing process,
- the produced signs the students learn about and analyse (from teachers, specification authors, other specialists, etc.).

The designer can communicate about the performed tasks and the plans for future tasks, i.e. his design activity schedule (Baldwin, Austin & Waskett, 2009). This proceeds in a spiral of steps, each of which is composed of a circle of planning, action, and evaluation of the results, in order to reduce the design uncertainty. The students’ enunciation activity (the ‘verbal modelling techniques’) helps us to understand how they link the tasks they have to perform to the teachers’ requirements, i.e. the TPACK.

We can speculate that the statement activity within the scheduled tasks plays a significant part in design skill achievement. Students verbalise their activity when they produce signs (a ‘design rhetoric’) as they want to show they have followed more or less the teachers’ requirements. They converse and subsequently they become more aware of their design.

To test this assumption, the experimental part of this paper was aimed at bridging the gap between curricula statements, design representations, and student utterances. More precisely, we focus on sustainability in students' designs and statements which are analysed and compared. Moreover, in the discussion we specifically raise the question of how to build a complete TPACK based on SD as a main subject matter.

## METHODOLOGY

The survey was conducted on students' activities in order to carry out qualitative research on the design learning process (Tortochot, 2012). Examination of the students' statements leads to a psycho-semiotic analysis (Lebahar, 2007).

This analysis is based on four samples. First, we observed the design learning situations. Secondly, we analysed the syllabi of two schools: UCA (UK) and ESADSE (France). Thirdly, four semi-structured interviews (Wengraf, 2001; Radlovic, Lemon & Ford, 2013) were carried out in each school: they provided a rich individual picture for each distinctive case. Fourth, in interviews, the designs were examined through representations (sketches, plans, 3D pictures, and other drafts), writings (sketches' comments, concepts, MA dissertation, abstracts), volumes (maquettes or prototypes).

We analysed two design learning situations:

- four English students were working on a 'locations project' in a creative module of their MA course;
- four French students were working on their MA dissertation preparing the MA project.

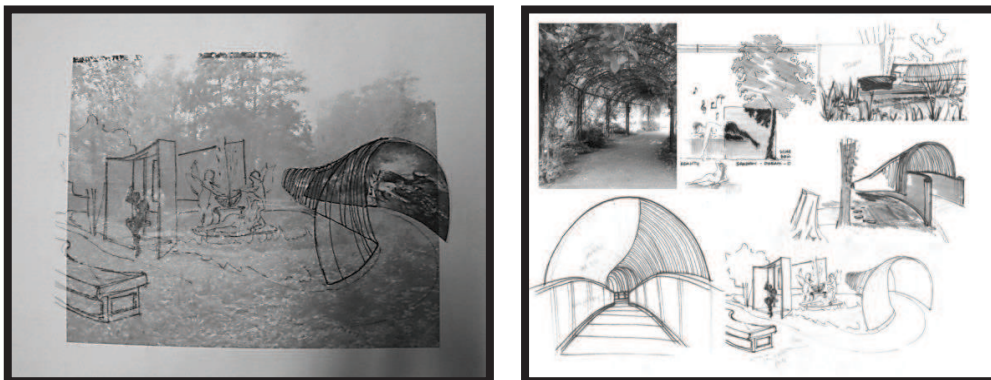
Students were observed during design learning situations in which SD was not the primary objective. However, all the students were systematically interviewed regarding SD issues as constraints.

The main design objective in both situations was not specifically SD, but it was an underlying factor. Interviews in French school were translated 'offline' into English by a native speaker.

## INTERVIEWS AND COMPREHENSION FROM STUDENT MEB

### Iconic system (verbal and non-verbal)

One of the British students, MEB, designed a covered footbridge over a river in a park (Figures 1 & 2). (NB: Before her MA studies, MEB had worked in an interior design agency for two years.) She associated an English garden with "Clair de Lune", Verlaine's poem and the Debussy's sonata, and with "Figures in a Landscape" from Watteau. The contents of her slide show (an obligatory part of students work) are very representative of her design project (Figure 3).



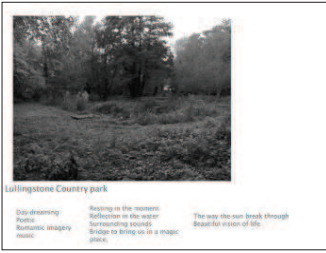
*Figure 1 & 2: some drafts of the meb project which is an ephemeral installation in an English garden*



**Slide 1**  
Title with a blurred Watteau picture in the background.



**Slide 2**  
Image of the English garden with significant features: contrasted and dark photograph.



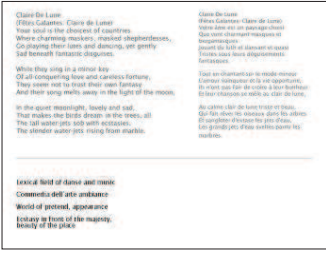
**Slide 3**  
Image of the garden (same features). Feelings in the park are in comments below the image.



**Slide 4**  
The three French artists mentioned in the project are presented using paintings, photos and dates.



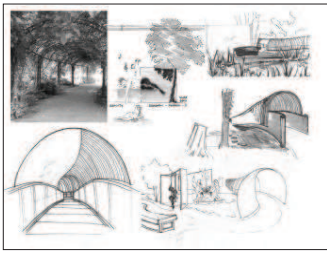
**Slide 5**  
The three French artists mentioned in the project are presented using representative masterpieces. Some comments below complete the presentation.



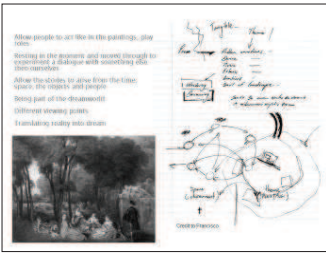
**Slide 6**  
The Verlaine's poem is transcribed in French and English and commented using a lexical analysis.



**Slide 7**  
A Watteau painting is presented (Figures in a Landscape) along with short comments and some interpretations.



**Slide 8**  
Some project sketches, along with a photograph of the site, without comments.



**Slide 9**  
Some other project sketches, with a Watteau painting. The comments allow us to understand the author intentions, especially the goal of the installation (the spectators moving, the points of view, etc.)



**Slide 10**  
Image showing the superimposition of the Watteau painting detail on the garden landscape.



**Slide 11**  
The author references.

**Figure 3: The description of the eleven slides made by MEB to explain her design**

**MEB's verbal statements**

MEB was questioned on SD considerations when designing in a natural site. The literal and figurative senses of the sentences are examined in the tables 2 and 3.



**Table 1: Quotes from MEB's answers and segmentation in elementary propositions**

Context of the answer elements	Elementary sentences quotes Selected propositions for the MEB discourse on the 'sustainability' (in <i>italics</i> )
<p>"What are the main design criteria for you ? Esthetic, ergonomics, technology, ethics, sustainable development, etc.?"</p> <p>- ( Long silence of thought.) Uh, if I am looking at the two projects I have made, there, those aren't necessarily ecological, I can't say that. But the environment respect in this way, but respect the place in which you are working, this isn't necessarily being sustainable or whatever dealing with the design, no, this is... It's on the tip of my tongue: 'obviously'. That's sure, that's obvious that we have to work in this way. But this is more matching the place. Is this a real criterion? And taking pleasure. It can be another criterion? Taking pleasure, I think, it's important, because we have to pay the courses (laugh)."</p>	<p>1. (Long <i>silence</i> of thought.)</p> <p>1a. If I am looking at the two projects I have made, there, those aren't necessarily ecological.              1a.1. <i>If I am looking at the two projects.</i>              1a.2. <i>The two projects I have made.</i>              1a.3. <i>Those aren't necessarily ecological.</i></p> <p>1b. I can't say that.              1b.1. <i>I can't say.</i></p> <p>1c. But the environment respect in this way...              1c.1. <i>Environment respect.</i>              1c.2. <i>Respect in this way...</i></p> <p>1d. ... but to respect the place in which you are working, this isn't necessarily being sustainable or whatever dealing with the design, no, this is...              1d.1. <i>To respect the place in which you are working.</i>              1d.2. <i>To respect the place in which you are working.</i>              1d.3. <i>To respect the place, this isn't necessarily being sustainable.</i>              1d.4. <i>To respect the place, this isn't dealing with the design.</i></p> <p>1e. It's on the tip of my tongue: '<i>obviously</i>'.</p> <p>1f. That's <i>sure</i>.</p> <p>1g. That's obvious that we have to work in this way.              1g.1. <i>That's obvious.</i>              1g.2. <i>We have to work in this way.</i></p> <p>1h. But this is <i>more matching the place</i>.</p> <p>1i. Is this a real <i>criterion</i>?</p> <p>1j. And <i>taking pleasure</i>.</p> <p>1k. It can be another <i>criterion</i>?</p> <p>1l. <i>Taking pleasure</i>, I think, <i>it's important</i>.</p> <p>1m. Because we have to pay the courses (laugh).</p>

**The discourse form: towards a 'rhetoric'**

The segmentation of the discourse about SD and her difficulty in talking about it (1., 1.e.) shows that MEB hesitates a lot (1., 1b., 1i., 1k.), cannot make a complete sentence (1c., 1d., 1h.), suggesting that she has not integrated SD in her design cursus.

She is obsessed with the 'criterion' (1i., 1k.) because she was questioned on the 'main design criteria'. In addition, she begins to be aware of the importance of SD, but she is not convinced

(1c., 1g.). She searches for her words and uses ‘obvious and ‘sure’ when trying to explain her work (1e., 1f., 1g.).

At the end, she makes fun of the ambiguity between her curriculum and her desire to ‘take pleasure’ in design (1j., 1l.). She emphasizes that she pays for her education (1m.). She worked for two years and she wants to increase her autonomy (1l.).

### **Discourse contents and representations: a specific ‘idiolect’**

Even though MEB is designing a footbridge in a park, and respecting the site, she does not recognize the relevance of SD. Her sketches, photographs and comments, show in fact that her project is perfectly integrated. Her installation shows she assumes the circular lines of the existing footbridge or garden path. She uses multiples tracing papers to shape the installation according to the ‘site specificities’.

However she does not seem to be interested in sustainability in itself, even if she agrees with the ‘obviousness’ of respect for the site. In other words, MEB does not believe in SD as a main design criterion, but she is concerned about the requirement of respecting the ‘location’. In a way, she says she has no choice: “*we have to work*”. According to her slide show, the main interest of her project seems to be based on the interrelation between the three masterpieces. Thus she does not pay attention to sustainability as she is focused on other priorities ‘as criterion’. As a result, she speaks in clichés and her ideas on SD are poor.

### **THE OTHER STUDENT ‘STATEMENTS’: HOW DO THE OTHER STUDENTS CONSIDER SD?**

Using the same methodology as with MEB we here try to generalize our analysis of the other students.

**MUCH ‘RHETORIC’ AND MANY ‘IDIOLECTS’ FOR A SD DEFINITION**

	Verbal non- verbal	Agree	Disagree	Indecisive	Syllabi & instructions
MEB An installation in a park	V	<i>Environment respect</i> Respect <i>the place in which you are working</i>	<i>The two projects I have made aren't necessarily ecological</i>	<i>This isn't necessarily being sustainable</i>	<p>“Such thinking recognises the potential role for the designer in realising a sustainable future (environmentally, culturally and politically) at both a local and global scale. However, it also acknowledges that, in order to realise this potential and to participate in the challenge of designing the future, the design profession is required to rethink the traditional boundaries and systems of design itself” (UCA, 2009, p. 4).</p> <p>A design project within a creative unit of the MA; it required them to work with a particular location: they had to choose and explore a specific site in order to produce a design which interprets or gives meaning to the place.</p>
	NV	Sketches, photographs show that the project is perfectly integrated in the site			
JD An information booth	V	Generally, trying to improve situations for people, making it an easier, <i>nicer place to live, perhaps</i>			
	NV	Photographs show the destroyed telephone boxes as a disaster			
BS A theatre event in old castle ruins (Macbeth)	V	No verbal mention		No speech	
	NV	Photographs and sketches show an old castle ruins by the sea Sketches and video show the spilled blood in the sea	Sketches on tracing papers show the event installation without empathy with the site	No pictures	
FRP Furniture in the Dover's white cliffs	V	<i>It's not something about fashion</i> <i>To focus on material development, precisely because of that</i>			
	NV			Photographs show the cliffs, the blue sky on the sea the sand and the port with the ferries	
ED A children's book	V			I should say maybe <i>ecological</i> . So, after, for me, the design, it has to be something <i>humble</i>	
	NV			Some graphic illustrations without relationship with sustainability	
JBB The disturbing artifacts	V	<i>The fine values of the design: the sustainability (without conviction)</i>			
	NV	Photographs and models show artifacts and various materials hand made			
JM The funerary ritual artifacts	V	<i>Thinking about the making with which kind of materials and how</i>			
	NV	Photographs of the Asian funerary ritual sites			
MJ The narrative artifacts	V		<i>“The ecology, I don't give a damn, because it's a pretty stupidity”</i>		
	NV			Graphic illustrations with half urban and half rural topics	

**Table 2: the collected verbal and non-verbal students' statements on SD compared to the SD topics in the syllabi**



## What do the students understand by SD?

**The students are not interested: SD is ‘bullshit’:** Sustainability does not find favour with student MJ (ESADSE) but perhaps she is not speaking seriously. “Ecology, *I don’t give a damn*, because it’s *bullshit*. But, really, *reading some things*... Because for the last ten years *we keep saying it’s a disaster, nothing was done*.”

**They are not convinced: SD is not a priority:** Student JBB (ESADSE) distinguishes the ‘fine’ design values (ecology and technology) used when the students are studying, from when they will become professionals “*I think that, maybe, when we’ll start working, it won’t be, it won’t be a priority in our job*.” Without conviction, JBB prefers to wait until he starts a job to choose good values.

**They are indecisive: maybe SD is a value:** Student ED (ESADSE) designs books, so the link with SD does not seem to be not relevant, even if she thinks that sustainability is a design value: “*the design, it has to be something humble. Something that can be intelligible. [...] In which the form follows function, [...] but I am making layouts. This is not the same relationship...*”.

**They are interested: SD is a tool and requires a strategy:** Student JM (ESADSE) says the relationship with the materials is significant and also the ecological aspect which is behind that. He considers more important the popular, humble and intelligible dimensions of the design: “*And now, we have to think about the making (of the object) with what kind of materials and how. And, so, furthermore, instead, with the materials on which I am working [...]*”.

**They are convinced: SD as an ethic:** SD cannot be just a fashion. Indeed, Student FRP (UCA) is afraid of the fashion trend of SD. He regards ecodesign as a solution for helping our world and our future: “*when I was beginning my studies in C., I wanted to, like, focus on material development, precisely because of that*”.

All students state they have more or less a positive opinion about SD but do not necessarily integrate it into their design. Students MEB and ED are the most *indecisive*. MJ is *uninterested* and angry at the sustainability lies. In addition, the graphic statements sometimes do not match the verbal statements. MEB and MJ disagree with sustainability in design, but their representations contradict this. For the *convinced* FRP, his SD conception does not match his representations. None of them refer to the schools’ syllabi when they speak about SD. To sum up, there is no relationships between the aims of SD in the syllabi, and the students’ conceptions and statements.

## DISCUSSION

Thus results show that some students talk about their own superficial ideas (MEB, JM, etc.): stereotypes, weak arguments, etc. However others express their opinions more decisively; FRP and MJ have sharp, smart but opposite points of view. Thus, all the students organize their values, skills, and design abilities in a vague disorganized way. They do not take into account SD as a constraint and some would prefer to wait until they have a professional activity, after the MA (JBB). The analysed utterances shed light on how design students express themselves in a particularly self-conscious and self-reflexive way which opens up a space of ‘discursive perceptivity’ (Paton, 2012).

The less precise or directive the requirements, the wider the space. In the absence of a SD specification, the students challenge the design pedagogical content (Tortochot, 2012). Both as novices or future experts, the students’ awareness does not hide their ignorance about SD. Instead of keeping their doubts to themselves some of them try to reduce uncertainty in order to product a relevant message through a new ‘design idiolect’.

All the MA students consider the importance of sustainability, more or less, as a value, when considered as a topic which they shared socially through various media, at school, with relatives and friends. Mawson shows that the “well-developed ability of children in their play” allows them “to establish and solve technological tasks” (Mawson, 2013, p. 449). So, students build themselves the pedagogical contents instead of the current and confused PCK. In fact, they gain a design skill (Lebahar, 2007).

The students express a peculiar ‘design rhetoric’ when they do not seem to master the SD topic. They are not aware of its three underlying criteria: the social and training dimension, the Design for Environment process, the organic vision for the environmental requirements. Considering the criteria as a knowledge, the analysis shows that the syllabi do not convey those ideas as pedagogical contents.

Using TPACK framework, SD in which the designer plays a pivotal role, could be defined as a specific topic based in the literature. The students’ statements could help them too, to achieve a PCK: they could increase the consciousness of the design activity and show the teachers their skills, knowledge or abilities. It could enhance current weak syllabi.

A valuable contribution to a design TPACK should take into account that students never quote their teachers or the syllabi, but prefer to use their own knowledge. The TPACK framework “does not speak about what kinds of content need to be covered and how it is to be taught.” (Koehler et al., 2014, p. 109.). In a predictive answer, Chai, Koh & Tsai (2013, p. 38) reported that “more investigations about students’ learning in general and for specific content areas” are needed. If the teachers used the students’ feedback, they would improve their teaching methodologies. In fact, Stables (2009) examines the expected harmony and dependability between creativity and ecodesign through partnership with professional practitioners. So, the analysis of the students’ activities shows the significance of the partnership of learners in the building of TPACK.

## CONCLUSION

This paper is a development of ‘design and technology didactics’ research to:

- organize the SD issue as a subject matter;
- adapt it to the diverse interests and abilities of learners;
- consider multiple dimensions: curriculum organization, teaching methods used, and their effectiveness in enabling and enhancing student learning (Williams & Lockley, 2012).

As Stables (2009) points out, the aim of such a study is to emphasize the need for further research on SD. SD could be a relevant topic in the pedagogical content or activity types in design learning situations within a TPACK framework. The design rhetoric and idiolect expressed by the students could be analysed to build PCK using SD.

This rhetoric and idiolect tell us much, perhaps even more than the pedagogical specifications, even if the utterances made by the ‘semiologically conscious designers’ are confused, uncompromising, or even paradoxical.

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