For a sustainable MOT education – Proposal for the integration of individual ethics development in the curriculum of a French Engineering School

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ABSTRACT

Through a practical example of individual ethics development based on reflective learning, this paper aims to show how it is possible to help students studying in a French engineering school specialized in MOT and Innovation to define and manage their own professional objectives.

While training requires students to develop new approaches to tasks and new modes of behavior, it also necessitates new approaches to the concept of self. Whereas training contributes to the development of the two former requirements through methods and tools that are specific to engineering sciences, it rarely contributes to an awareness of and a conscious construction of the self.

Learning to develop reflective modes of thinking may be a condition for building self-awareness and for generating new attitudes towards professional life.

For the students this entails becoming conscious of the values conveyed by the system (the given), the values that they have received (the transmitted) and the values that they wish to adopt (the created).

We propose to demonstrate how creating a dynamic interaction between this aspect of learning and a pedagogical approach that centers around in-company project-based training can lead students to build appropriate professional skills, to say who they are, to express how they have internalized their training and to better meet corporate needs.

KEYWORDS

education, Sustainable education, reflective learning, individual ethics

1 THE REASONS AND OBJECTIVES BEHIND A COURSE IN REFLECTIVE AND ETHICAL FUNCTIONING IN THE ENGINEERING STUDENT'S CURRICULUM

1.1 The context

This study was conducted in a French Engineering school that produces engineers specializing in the management of technological resources and innovation. In their capacity as future managers, their task will be to help evolve the system and the company towards other horizons, albeit ensuring its sustained development.

When executing his/her work, the manager's frame of action is no longer limited to individuals or to interaction with others. The relationship with the system and the company introduces a sort of collective space that brings with it its own temporality, its rhythm of functioning, its limitations , its laws and regulations, and its aims. At the same time, the company owes its strength to the fact that its actions and its objectives are accomplished through people who can shape it.

Training an engineer to become the kind of active worker who can shape his/her company's future involves guiding her to reflect upon the interaction of the three dimensions of his/her life experience, namely:

- the life experience he/she undergoes as a subject,
- the life experience he/she builds out of his/her contact with others,
- the experience he/she acquires from his/her perception of the activity in the company.
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It also entails bringing it to his/her attention that in the perspective of a company being an institution, he/she must acknowledge the following fact: in order that an experience be meaningful, personal endeavor has to be compatible with that of the company and that one seeks in one's interaction with others.

1.2 The rationale behind the instruction

Establishing such compatibility constitutes a basic principle guiding engineering instruction in the streams of management and innovation.

Engineering students are usually trained for action. Their curriculum is centered upon the transmission of knowledge related to their discipline and methodological techniques that help develop the aptitudes required of them. They are also equipped with skills that make them rapidly operational in the professional sphere. The emphasis is on the 'technical' aspect of their reasoning, owing to the fact that their professional life consists in executing assignments, resolving problems, and developing projects. In the face of these tasks, the future engineer learns to set his/her operational goals, to seek results keeping the context and the openings in mind, and to set in motion his/her scientific knowledge and technical skills.

The question is, does this suffice? Notwithstanding all these inputs, a lingering doubt persists in the minds of the students, which could be expressed thus: When I'm actually working in a company, how will I handle it all? Maybe I need to develop something else yet, such as the aptitude for thinking before an action and for thinking while performing?

T o develop such an aptitude would mean to cultivate a thinking reflex. Not one that acts sporadically, but rather one that grows into a "disposition", in other words, a whole new approach to action. This assumes generating a concurrent reflex of an ethical nature that prompts re-examination that is more global yet more personal at the same, concerning action with respect to oneself, the others and the company as a whole.

Such a training in reflectivity would then be part of the curriculum, not only in the form of a means to combine theoretical knowledge and practical action, but also as an end, in view of guiding the students towards greater self-reliance and professional accountability. The attractiveness of the idea lies in the fact that technical reasoning is coupled with ethical and reflective reasoning.

The latter kind compels the former to take into account the frame of action, the interaction between those involved, and the constraints and stakes associated with the corporate setting. At the same time, though, technical reasoning compels ethics to accommodate the reality of business.

Ethical and reflective reasoning impinges on action in such a way that the latter is no longer merely instrumental, but is heartfelt, in other words, the person taking the action would have reflected on his/her own intentions, on the choices open to him/her, on the implications it has and the values that accrue to him/her .

The contract of Employment	Enquiry on the ethics of actions	the direct stakes operating	the objectives pursued
⬚	⬚	⬚	⬚

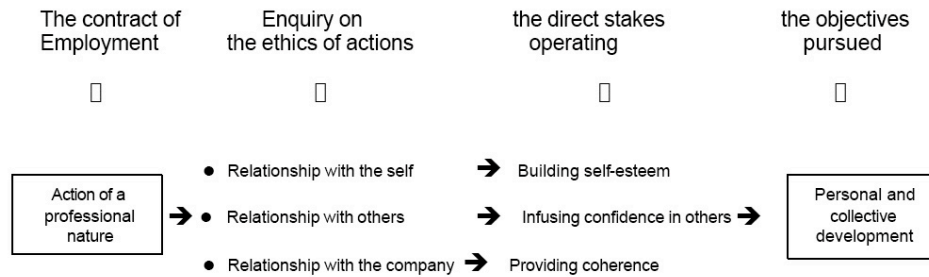|			
Action of a professional nature →	• Relationship with the self	➜ Building self-esteem	Personal and collective development
	• Relationship with others	➜ Infusing confidence in others ➜	
	• Relationship with the company	➜ Providing coherence	

Table 1: Ethical approach in the work context (Claude, 2002).

Such an attitude produces a keen insight into the reality and the functioning of the company, which in turn and causes actions to be coherent, and makes it possible to anticipate. In practice, the instruction rationale makes it possible to establish a relationship between the acquisition of such functioning and a training based on industrial projects focused on action.

1.3 Instruction: a means of instilling a conduct

The curriculum aiming at developing the ethical and reflective behavior is a long-term process, being spread over three years.

It seeks to emphasize not only developing one's skills but also instilling a conduct. The notion of conduct stresses the choice open to a subject who takes a personal approach to action in a global (in this case corporate) context that has become precarious.

Now, in his/her conduct, the engineer brings to bear certain values that make him/her accountable along with the company and the system as a whole. Such values are rarely explicit, nor is the subject aware of them. But without reflective functioning, it is impossible to develop a system inasmuch as it cannot be called into question.

What is required then is to set up an instruction that allows one to enunciate these values and attribute meaning to action oneself, before others can do so. It also requires that one be led to realize that conduct, being specific to the individual, will always be a creation that will affect on oneself, the others, and the company (Table 1, *(Claude, 2002)*).

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In practice, the instruction rationale makes it possible to establish a relationship between the acquisition of such functioning and a training based on industrial projects focused on action. The concept of a conduct in fact corresponds well to what the company expects from a worker. It expects him to take initiative based on personal creations, within the constraints of the company and the context. The concept also helps meet the need for self-actualisation in work, indispensable for compatibility between the three dimensions of personal experience.

In practice, such a course operates around three «hubs» of training:
- A first, called «towards engineers' ethics», which deals with elucidating the values of reference of corporate groups, especially of the company.
- A second called «return to one's own experience», which encourages a certain detachment from corporate values that attends the necessity of recognizing one's own.
- A third focal point called «elaborating one's professional objectives», whereby the student fashions himself into the architect of professional objectives, his own.

In concrete terms, producing such a conduct is achieved by means of associating the process with a book.

2 EXPERIMENTATION : THROUGH THE ETHICS OF READING

In what way does the interaction between two apparently unconnected activities, viz., a course in reading, and one in industrial project, contribute to establishing a reflective disposition -- key to improving the professionalism of the engineering student?

2.1 Why choose a course in reading?

2.1.1 A book - a defiant given: understanding the difficulty posed by a given, operating over space and time.

A text or a book, functioning as a collection of symbols, exists physically in paper, three dimensionally, and calls for perusal at a rhythm and in a space dictated by the very structure of the narration. It induces the reader to adapt himself to its sphere, the structural make-up and meaning of which are in a certain sense beyond the reader's power. «If a text be a collection of perfect symbols, then it is never finished. One could say that it is stroked. No matter how much analysis, research, exposure and throwing open a text is subjected to, it still unfolds, it remains inaccessible, yet to happen. It comes forth, only to disappear just as soon.» (Ouaknin, 1994).

A text is always both visible and invisible -- an ambivalence, a puzzle, its meaning ever shifting.

It is from this standpoint that a book presents a two-fold defiance to the engineering students:
- First, they have great difficulty giving themselves up to reading a text, "since they have other things to do" by their own admission.
- Secondly, not since their schooldays have they read through a whole book.

Moreover, due to its structure the selected text poses constraints of literality that are complex and inscrutable owing to the diverse levels of meaning possible.
We chose to explore Michel Tournier's "*Vendredi ou les limbes du Pacifique*" (Friday or the limbs of the Pacific)

2.1.2 The text, a chance to seek something beyond the manifest and the known

"Real life is basically hermeneutic because it is in man's nature not to have a nature, he is defined by his defiance of definition, man must reinvent himself, rebuild himself, he must develop".

In the text that is explored, "Robinson", who is placed in a situation at the borderline of survival, must invent solutions, find his way out of recurring deadlocks into which his own misconceived choices take him; he must devise solutions and test their soundness, until such a time as he becomes what he himself chooses to be.

Comparison was therefore inevitable first with the project scheme, since it involves one completely, and secondly with industrial projects, in which one must set down a policy and a mode of evolution whereby one can become the instigator of one's choices, not without modifying the given and fulfilling corporate needs.

" In this sense, the book brings to light the very act of thinking which consists precisely in upsetting ready-made institutions of meaning, in which every place has its place, every moment its hour." (Ouaknin, 1994)

2.1.3 With a book, one first reads then interprets

The action of reading creates a distance between two accounts, one that is already present, materially and in the ordering of the symbols (which could be compared to the culture of a society and a company and to manners of functioning), and another account that is created in the course of interpretation.

This distance could be termed as the 'intertextual'. It is the property of a text of never simply being itself but accepting numerous interpretations, depending on how it is read. Consequently, a text continually reinvents itself.

In the virtual space between texts and words, the reader could reinvent language.

A book would then come to symbolize the impossibility to get trapped in a single meaning, just as it would represent the dynamics of creativity within a complex system.

2.1.4 A book calls for « ethics of reading »

Reading a book is a different task from teaching, the latter involving an exchange of words between two living persons.

While reading, however, the reader finds himself/herself face to face with a text, without necessarily having anything in common with the author. Accustomed as he/she is to receiving theoretical - essentially scientific- instruction, and to putting methodological skills to use, the student faces a rare situation -- that of a symbolic world where the symbols do not have their ordinary meaning.

To read the book " Vendredi ou les limbes du Pacifique" means to project the text into a world, since it affords various planes of reference, as follows:

- To begin with, it exists in the sphere of everyday language describing an everyday reality. The sentences and the words used describe the world in which Robinson lived. The language explores the usual solutions that man devices when confronted with a given situation. The book, at this level, is a description of the courses of action explored, specifically by the western society that haunted Robinson.
- It also exists in the register dealing with «neutralization of the world» particularly since Tournier's book comes back to the Robinson myth of a man living in isolation - describing human condition devoid of the social dimension and the possibility of another kind of existence.

At this level, by suspending the ordinary world, the fictional world opens up access to the symbolical dimension, i.e., of building the self not only to be a part of the world but also the self for its own sake.

This accession to the symbolical isn't without significance. It lingers in the mind of the engineering student, finding resonance in certain rarely surfaced aspects of himself/herself, eventually paving the way for self-comprehension. Comprehension that leads him/her to become the architect of his/her objectives.

- The suspension of the real world, caused by the access to myth, prompts the reader to recount, to create. The narrative becomes a creation driven by a desire. It bids the reader to dismantle the book from an unbroken whole, and to reshuffle and restructure the narration following a faculty of drawing an analogy between two sets of elements: on the one hand, the different moments of the reconstitution of Robinson's new life [in his relationship with himself, with the others (Friday and the dog) and with the world (i.e., the island)] and on the other hand, the different moments in the course of an industrial project (led by the student himself/herself, involving others, and in a given context.)

-   The moment of action is now opportune. The variations, the symbolical play, the metamorphosis of the various readers, all bring out a fundamental phenomenon: adventure, chance, encounter, a sense of «letting novel possibilities prevail upon oneself» which all lead to the power to decide and to choose.

Here, imagination and narration both explore Robinson's various manners of being, the series of reference models he applies, the questions arising from the values that his actions exemplify, and the courses open to him.

The engineering student is quite aware that Robinson is none other than himself/herself, and will have no difficulty whatsoever in finding the connection, when the time comes, between Robinson's destiny and the endless possibilities of being that will constitute his/her life as a person, an engineer and as a citizen. All he/she has to do is to expound, for his/her own benefit and for that of the group, how he/she was tempted, in the course of the project, to adopt certain models of reference, how he/she had to take up other values, why he/she would choose to espouse certain values and not others, how he/she was going to move on towards self-reliance and create his/her own models.

Therein lies the ethical necessity to become aware of the reasons for which one espouses certain values.

3 THE SHIFT TO WRITING = THE MEANS OF RELATING TO ACTION
At the close of assignments allowing analogies to be drawn between Robinson's experience on his island and the student's experience on his/her project, it is quite possible to stop at this stage, and limit ourselves to the exercise of resonance that we call the ethics of reading. Yet there still remains a transfer to be achieved -- the transfer from the experience drawn from the book to that gained from the project, in terms of their relationship with themselves, the others and the company.

For this reason, the activity of reading leaves a task to accomplish:

-   To carry out, throughout the course of the industrial project and at every stage of it, an exercise in reflection both in a group as well as for oneself, and to measure one's progress on the experience one has gone through, the obstacles encountered, the openings available and the values exemplified.

-   The work on one's reflective capacity makes up the subject material of a written report, submitted along with the project itself. Even though the report is a separate item, it has to be a reflection of the actual capacity of the group as well as the individual to carry out self-analysis. A perusal of these reports reveals that learning reflectivity through ethics of reading is directly linked to what the students discover about the functioning of a company while managing the project.
    He/she realizes that he/she holds values that he/she has received from his/her upbringing and culture.

He/s he finds that convergence doesn't necessarily exist between the values he/she holds and those conveyed by the company, in ways not always consistent. He/she realizes that this lack of agreement forces her to choose, and that such choices have a bearing on the company's future, on interpersonal relationships on a professional as well as personal plane, and on policy decisions.

Further he/she finds out that these choices must be justified and founded, in order to do which he/she requires the ethical and reflective approach to sort out the values he/she chooses to adopt the values he/she refuses to espouse and the values he/she protests against.

Such an evolution, from a model that is unquestioningly accepted to one that is weighed and chosen,

opens up the possibility for originality and innovation. The student thus shapes himself/herself as the architect of his/her professional and human objectives. The following are some excerpts from feedback obtained from groups of students:

"Having a reference point to compare a project to is an effective means of enriching one's personality, and analogy is a particularly powerful tool to accomplish this."

"The group also learned that certain constraints posed by projects could hide the opportunities afforded, and vice versa, and that only by a judgment based on reflecting upon oneself was it possible to sort out certain situations."

" Robinson shifted from a life governed by established ideas and by rules imposed by society, to one founded upon his own needs and desires, in other words, to a life in harmony with his 'choices of life'".

It is this final phase of Robinson's life that inspired us throughout our project: a respect for our life choices, our needs and our desires, in the work situation.

CONCLUSION
In the professional context, integrating a reflective approach into the professional self of engineers liberates them from stipulated tasks and encourages them to elaborate their own initiatives, keeping in mind the circumstances, the environment, possible partnerships and collaborations, and corporate needs. Elaborating their own program in this way seems even de rigueur in the new global and economic environment, which demands a thorough understanding of complexity.
In a project management situation, if committed reflection and ethical enquiry are permanently taken up in conjunction, then it becomes imperative to develop professional judgment that operates at the junction between a keen understanding of prevailing conditions, consideration of others and the development of self.
As can be readily seen, reflective and ethical functioning is not simply a superfluous addition, nor merely an additional story in the edifice of aptitudes. On the contrary, it is a common principle running through all the aspects of the instruction imparted to future engineers; it is a disposition to inculcate.

The economic conditions in fact demand such a disposition. Companies require employees who bring out the best in themselves by way of actions in harmony with the context, which is the cultural model that the company presents, but also with what he/she really is. «Today, in practical working contexts, the fulcrum and the bottom line of a company is the quality of employee behavior, » maintains J.-F. Claude, in his work "L'Ethique au service du management" (Claude, 2002).

The inculcating of a reflective and ethical disposition throws up three related issues:
- Perhaps broadening the scope of research and research training, particularly in the social sciences; the extent to which training meets the development of a reflective disposition would depend on such a widening of scope.
- Quite apart from research, incorporating devices aimed at developing reflective functioning and ethical awareness in the curriculum on a more regular basis, especially in engineering schools. These devices would go on to help produce researchers working on systems by means of which one could elaborate the stages of a complex teaching assignment.
- Entering into the professional apparatus not only through a central role at the training stage but also by eliciting involvement from company interested in the development of this asset, by means of project partnerships. The companies would create conditions favorable for their managers to putting the reflective and ethical disposition into service and would conduct in - company training in such a way that individual ethical resources get an environment propitious to manipulating theoretical knowledge in the concrete realm.

Without such give-and-take, discussing ethical aptitude would continue to be difficult: since future employees are expected to equip themselves with personal ethical resources, employers would in return be expected to create work conditions favorable to ethical enquiry, and to provide the former with opportunities to express and exercise it.

BIBLIOGRAPHY

Arendt H. (1983), Condition de l'homme moderne, Collection Agora, Editions Calmann-Lévy, Paris.

Boutinet J.-P. (jan 1999), Anthropologie du projet, *Psychologie d'aujourd'hui*, PUF, Paris.

Claude J.-F. (sept 2002), L'éthique au service du management. Concilier autonomie et engagement pour l'entreprise, *Entreprise-Carrières* , Editions Liaisons, Paris.

Defoe D., Robinson Crusoe.

Domenach J.-M. (1994), La responsabilité, essai sur le fondement du civisme, Editions Hatier, Paris.

Etchegoyen A. (1991), La valse des éthiques, Collection Agora, Editions François Bourin, Paris.

Habermas J. (1992), De l'éthique de la discussion, Editions CERF, Paris.

Hottois G. (1993), dir., Au fondement d'une éthique contemporaine, Jonas H. and Engelhardt H.-T., Editions Vrin, Paris.

Jonas H. (1991), Le principe responsabilité. Une éthique pour la civilisation technologique, Editions CERF, Paris.

Main E., Piattelli-Palmarini M. (1974), L'unité de l'homme 3. Pour une anthropologie fondamentale, Collection Points, Editions du Seuil, Paris.

Ouaknin M.-A. (feb 1994), Lire aux éclats, Eloge de la caress, Points Essais, Paris.

Perrenoud P. (aug 2001), Développer la pratique réflexive dans le métier d'enseignant, *Pédagogie recherche*, ESF Editor, Paris.

Ricoeur P. (1991), Lectures. I. Autour du politique, Editions du Seuil, Paris.

Tournier M., Vendredi ou les Limbes du Pacifique.