"TEACHING WITH EMERGING EXPERIENCE" to develop leadership and innovation skills

Dimitri Dagot, Serge Delle-Vedove, Luc Roullet, Nicolas Pasquet, Jean-Michel Gillet, Dominique Pareau

Ecole Centrale Paris, France
dimitri.dagot@ecp.fr

Abstract

This paper is based on a hands-on session proposed at ALE 2009 Conference (Active Learning for Engineering Education). It presents a teaching practice used at Ecole Centrale Paris (ECP) to foster engineering students' leadership and innovation skills and to help them going through major paradigm shifts.

Considering a class as a human complex system, teachers work in a posture of facilitators or coaches who orchestrate a learning process. Instead of transmitting knowledge as traditional professors, they focus on the relationships in the classroom and the experience emerging from them.

Workshop Topics
Human scale engineering; The role of emotions in learning; Autonomous learning

I   INTRODUCTION

Today's engineering students will have to face the complex challenges of tomorrow's world. Classroom itself is a complex system with its participants and professors/facilitators. As relationship and emergence are key features of complexity, can they be valuable tools for pedagogical process?

A team of faculty at ECP explores the use of these tools. They presented a hands-on session on the topic at ALE 2009 Conference (Active Learning for Engineering Education). This paper relates the context of their experience, a brief conceptual overview, a description of the ALE hands-on session as a case study and a discussion of the key questions associated to this type of teaching.

This paper relates a construction in progress made by a team of reflective practitioners. Experiences, findings and assumptions are shared here with humility, in a spirit of generating exchange between colleagues and potentially inspiring future research.

II   CONTEXT: A NEW ENGINEERING CURRICULUM AT ECP

What type of skills do we provide our future engineers with, to make them valuable contributors to their organizations and to their society?

In addition to technical and scientific skills, human skills appear to be fundamental to cope with 21st century challenges. The revised strategy and curriculum of Ecole Centrale Paris has underlined that to answer private sector and societal needs, engineering students will have to be leaders, innovators and entrepreneurs - as professionals as well as citizens. They need therefore to develop these capabilities as soon as possible in their engineering curriculum. This requires some strong paradigm shifts in students' and professors' mindsets and attitudes, toward a trans-disciplinary and systemic vision of a complex world. It also requires the ability to understand and manage human dynamics in complex problem solving: for instance change management, leadership, self-knowledge, motivation and cultural diversity.

We identified these questions as a major challenge at ECP and decided in 2006 to redesign our engineering curriculum. In this context, a new way of teaching soft skills through trans-disciplinary workshops has been introduced: the 'Leadership and Professional Development Workshops' (LPD workshops). The whole incoming 3rd year cohort in engineering studies (450 students) attends 7 workshops of 2 days over 16 months. They explore a wide range of subjects linked by a trans-disciplinary approach, such as: being an engineer in the 21st century, leadership, entrepreneurship, innovation, creativity, teamwork, communication, complex problem solving, self-knowledge. A trans-disciplinary team of 25 teachers has designed and given this course for two years: scientific professors and researchers, soft skills specialists, business leaders and entrepreneurs.

III   POSTURE AND CONCEPTUAL FRAMEWORK

The following frameworks have inspired, sometimes explicitly, sometimes implicitly, the development of LPD workshops:
- *Complexity theory and system thinking* (Morin [9]), as good modeling tools for the 21st century challenges faced by mankind
- *Humanistic and positive psychology*: one part of the workshops mission is to help students on their way to realize their potential, to become 'a fully functioning person' (Rogers [12])
- *Active learning*, as a more adapted tool to teach soft skills than traditional lectures, with a special concern on students motivation, autonomy (Giordan [5], Carré [2]) and purpose issue (Prouteau [11])
- *Learning organization* (Senge [14]), at three different levels: university, the teaching team and the classroom with students and professors. Teachers consider themselves reflective practitioners (Schön [13]) in a learning process, both at the individual and at the organizational level.

Based on these frameworks, the teaching team managing LPD workshops has progressively formalized a posture of coaches or facilitators who help students in the development of their potential rather than the posture of a transmitting knowledge professor. We have called this posture 'teaching with emerging experience'. The key features are:

- Giving space - alongside the deductive scientific approach - to subjectivity, emotional intelligence, understanding of diversity, meaning-related questions, in order to achieve sustainable change and impact
- Building authentic relationships in the classroom to allow for exploration, risk-taking, creativity, and experience of errors and successes.
- Setting up a co-construction spirit, where teachers and students are co-responsible for the outcome of the learning process
- Emphasizing that learning comes from experience - in the classroom or in real life - and that experience or theory alone is not sufficient. Experience should be revisited with theoretical inputs and reflection with debriefing questions such as what did I experience? How did I change?
- Living in a dialogic equilibrium [9] by trying to unify often-separated knowledges, i.e. science/business, hard/soft skills, reflection/action…
- Defining a very clear and shared learning purpose and correlatively using a flexible pedagogical process, to explicitly take into account emerging realities and enhance the learning experience.

Why do we give such an importance to 'emerging experience'?

Classroom may be considered as a practical lab of complexity, comparable to a practical lab in industrial design or chemistry. A classroom is a complex system, i.e. a system composed of interconnected parts that as a whole exhibit one or more properties not obvious from the properties of the individual parts. A complex system's main feature is emergence, that we can define it as "the arising of novel and coherent structures, patterns and properties during the process of self-organization in complex systems" [6].

The impacts of complexity and emergence on learning have previously been investigated through different perspectives, as ways to:

- Stick to the current reality of the class and to the learning needs of the students, and thus be more efficient in active learning (Parks [10])
- Listen really to individuals and groups, to allow a profound learning and change through deep dialog (Bohm [1], Senge [15])
- Develop reflection-in-action skills as teachers (Schon [13], Vermersch [16])
- Develop professional and human skills such as creativity (Csikszentmihalyi [3]) and leadership (Heifetz [7])

All these perspectives inspired and are integrated at different levels in LPD workshops.

IV   EXAMPLE - THE ALE WORKSHOP

A teaching session based on this posture may take very different forms, depending on purpose and context. As an example, the hands-on session proposed for ALE 2009 was aimed at exploring a complex question with a class and then reflect on 'teaching with emerging experience'.

The complex question had been chosen to be meaningful for the participants, teachers in engineering education attending an active learning conference. Participants worked for 2 hours to collectively answer the question: 'Which skills for the engineers to successfully address the challenges of 21st century?'

IV.1 Flow of the Workshop

Process	Objective
1. Define workshop's purpose and set the rules (15') *Define the purpose* - Explore as a group a complex question to create real value in only 2 hours - Reflect and learn about 'teaching with emerging experience' *Set the rules* - Respect and listening - Add ideas onto others', no censorship - Pause button : anyone can stop the discussion at anytime to reflect on what is happening	Make the group (participants and facilitators) co-responsible in order to reach an ambitious purpose. The workshop flow is flexible, but its purpose should always be clear for everyone. All participants should feel at ease to share voice and ideas in a positive context.
2. Inclusion (15') Each participant presents himself in 1' using the questions: who am I; what results from an ideal teaching experience for me; if I were not doing what am I doing now, what would I do? Process: first, 5' of individual reflection then sharing in groups of 5 where each person speaks without being interrupted.	Build trust: I can express myself on who I am; I am listened to; I experiment a time to listen openly. Set the human being in the center of the process (and not only brains and ideas). The subdivision in 5 helps to efficiently deal with large groups.
3. Sharing on why the workshop question is relevant (45') Before working on the workshop question itself, find out the reasons we are working on it. The question was: 'Melissa was born last year. All of you know of a child born this	Anchor the workshop question in higher societal and personal needs, by involving participants on internal motivation, to find common purpose This might reveal

year. These children will live most of their life between 2010 and 2100. What do we (i.e. teachers and their students) have to work on during the 20 years to come to prepare a good life to this child?' Process: - Individual thinking - Sharing in group of 5 - Deliverable: 1 poster by group - Sharing between the different groups	different representations of the question that would limit the exploration of questions if they were not shared among participants. Individual thinking before speaking to build one's personal ideas. Listening to each other before debating: I am enriched by the ideas of others; the 'natural speakers' do not monopolize time
4. Deep dialog on the core question (45') Bring creativity and value on: 'Which skills for the engineers to successfully address the challenges of 21st century?' Process : - Individual reflection (a sensorial meditation can set up a context of deeper reflexion and generate more openness and creativity) - Elementary 'Bohm Dialog' : each participant can express quickly an initial ideas or ideas emerging after the others' intervention; no debate, just a flow of ideas; - Deliverable : a mind map of all the ideas	Using the power of a group to scan the subject in breadth and depth. Density by short speeches (1') allowing lots of inputs. Creativity through emergence when people let go their own ideas to build on the others. Understanding the other by listening to him/her.
5. Conclusion (15') What did we experience? What did we learn? What are our questions? Did we reach our objective? What is the next step?	

IV.2 Outcome of the Workshop

The participants of the workshop produced valuable deliverables. They expressed surprise to the depth of the mobilization of their collective intelligence, and satisfaction with the results. In this short 2 hours session, they experimented leadership & innovation skills (see first point in discussion hereafter).

An unexpected 'emergence' from the workshop was that the group of participants decided to lead similar workshops in their respective 6 countries. The purpose of it will be to compare the needed skills for engineering seen by students and professors across various cultures.
Another unexpected 'emergence' occurred during a break. Some participants realize that lack of listening skills is one of the reasons why mankind faces so many challenges and conflicts. They realized the responsibility of education and educators for this lack of

listening skills. In traditional teaching, students are used to listen to the professor, and professors to deliver their knowledge. The implicit role modeling is therefore that authorities are not supposed to listen, but students are. With the 'teaching with emerging experience', the professor positions him or herself not only as an authority figure, but also in a listening mode. This type of teaching therefore ambitions that the students - when in authority position, as engineers, experts or managers - will also be able to demonstrate better listening skills, the kind of skills that can help societies to be more inclusive, creative and innovative.

In LPD workshops' experience, 'teaching with emerging experience' can indeed produce these 'spillover' effects outside of the classroom.

IV   DISCUSSION

How does 'Teaching with emerging experience' help to develop leadership & innovation skills?

Exercising leadership can be defined as helping a group to face its real problems in order to find efficient and sustainable solutions in a spirit of progress for society.

What participants live in classroom is a direct application of this definition:

- They face a complex problem with no clear given solution, handled by a complex system (the classroom): a solution might progressively emerge from their interaction
- They have to stick to their purpose and not avoid it, since they are responsible for a large part of the process
- They explore it as a team trying to use at best the different skills of each participant, including teachers, and let the innovative and practical solutions emerge
- They learn about their own way to bring value to a group
- They learn how a human system like a 'classroom' functions, with its mistakes and successes
- They experience self-reflection aimed at action.

As far as innovation is concerned, 3 core skills are developed:

- Ability to listen to one's own creativity and to be more creative as a group
- Ability to think in a dialogic mode, where dual realities have to be attended at the same time: purpose/emergence; self/system; cognitive/emotional intelligence; vulnerability/strength; soft/hard sciences; …
- Ability to question motivation and sense of purpose, as key drivers for innovation.

How to manage a learning mode that touches the person deeper inside? What are the opportunities and the risks? How to handle these risks?

To face the complex issues of our time, professionals need a better knowledge of their inner workings (Senge 'personal mastery', Heifetz 'inner voice', Goleman and Gardner different types of intelligences, Kegan 'immunity to change'). It is self-knowledge work aimed at professional efficiency.

At the same time, in a post-modern world where men and women look for meaning in their life, both at personal and professional level, it is also important to acknowledge the

personal impact of this self-knowledge work. Education professionals have to manage with care this question, by:
- Explicitly facing the questions that derive from the mission of their institution (i.e. helping the development of a Citizen, helping the development of the students' professional potential)
- Knowing when and where to stop with these questions, either because it is not the purpose of the institution (it is the private sphere of the students) or because the teachers are not competent at handling it (in this case, they have to redirect the student to the right helping environment, for example to counseling or psychologist)
- Taking into account the variability between students' characters, needs and maturity regarding these self-knowledge questions.

What are the conditions for making this teaching method possible?

Facilitators need to create a solid and firm holding environment: emergence takes place well only if students feel comfortable and reassured in the space created by the professors. The paradox here is that flexibility within the class requires a clear authority displayed by the teaching body, especially in terms of clear rules within the classroom, clarity of the general outline of the class and pedagogic objectives, and team spirit and partnership demonstrated by the teaching body to make the participants feel that they are in good hands

Besides, teaching with emerging experience requires that the facilitators:
- Pay careful attention to the class physical setup, so that it fosters relationship and trust. The participants should sit in a way they can see one another. The U or circle shape is good, the small group format around tables is also possible
- Create a conducive environment for free expression: they may put themselves at the level of the students, for instance by sitting in the midst of them, or they may express vulnerability e.g. by answering 'I don't know' to some questions
- Are very present to students' needs: they need to listen and observe the students, to interact with them and accompany their gradual realizations and learning. Beyond 10-15 students, we recommend at least 2 facilitators to run the class, so that one can drive the class while the other one is more on an observing mode and can intervene as a complement
- Have a very strong anchor in the purpose of their class, in order to make sure that by the end of the class the pedagogic objectives are reached, no matter the path taken to get there.

Which tools can help in this kind of pedagogy?

In order to manage this very flexible process, teachers should be aware of teaching tools they can use depending on the context:
- Mind-map, useful to write down an emerging process in real time
- Dialogue [1] as a way to deeply share ideas with a group

- Case-in-Point [10] as an approach to use what is happening in the classroom as the case
- 'Giving the work back' to the class, to develop autonomy and co-construction spirit
- Presentation of theoretical models, to help students to decode what is happening
- Anchoring the participants in the session's purpose, with a question such as 'are we working on our real purpose of today?' to stay focused within a flexible process.

Which skills for the facilitator?

The main skills needed are:
- Listening skills, verbal and non-verbal
- Maieutics pedagogy more than content delivery: pedagogy of questions and conditions, letting the answers arise from the group
- Self-awareness: What do I feel at the present time? How does it affect my teaching? What are my strengths and blind spots in this type of situation?
- Ability to deal with complexity in real time, especially human system dynamics and multi-levels system analysis
- Accepting partial incompetence and vulnerability: the facilitator doesn't know everything, s/he may fail. Still, s/he needs to be a role model and therefore knows what to do in case of failure; s/he knows that partial incompetence is a property of dealing with real complex issues; s/he is learning in the process and in the group.

It is a demanding teaching style, with some skills often new to professors. They should be helped to develop these new skills, by:
- Co-teaching as a good practice to overcome their blind spots and taking some risks (protected by the co-teacher) to rapidly learn
- Reflecting on the practice, i.e. working on examples with peers groups
- Knowing theoretical framework
- Working in a trustful environment: ideally with a close group of colleagues to share experience and learning, and also with the support of the institution management for innovative teaching forms.

VI   CONCLUSION

The 2-year experience with 'teaching with emerging experience' described in this paper suggests that this modality is conducive to the development of leadership and innovation skills in a complex world. It calls for future research works. It would be important to evaluate more precisely the change that occurs to the students' skills in innovation, leadership and learning, and compare this method with alternatives. Moreover, it would be interesting to explore the teacher's perception of emergence: What do I perceive? What are the conditions? How do I make sense with this perception? How do I connect it to action in real-time? How do I develop this perception skill?

REFERENCES

1. Bohm, D. (2004). *On dialogue.* Routledge

2. Carré, P. & Fenouillet, F. (2009). *Traité de psychologie de la motivation.* Paris, Dunod

3. Csikszentmihalyi, M. (1997). *Creativity.* Harper Perennial

4. Demouchel, P. & Dupuy, J-P. (1982). *L'auto-organisation: De la physique au politique – Colloque de Cerisy.* Paris, Seuil

5. Giordan, A. (1998). *Apprendre !* Paris, Belin

6. Goldstein, J. (1999). *Emergence as a Construct: History and Issues.* Emergence 11: 1999, 49-72.

7. Heifetz, R. A. (1994). *Leadership wihout easy answers.* Cambridge, The Belknap Press

8. Kegan, R. & Laskow Lahey, L. (2009). *Immunity to change.* Cambridge, Harvard Business Press

9. Morin, E. (2000). *Les Sept savoirs nécessaires à l'éducation du futur*. Paris, Le Seuil

10. Parks, S. P. (2005). *Leadership can be taucht.* Cambridge, Harvard Business School Press

11. Prouteau, F. (2006). *Former…oui, mais dans quel sens ?* Paris, L'Harmattan.

12. Rogers, C. (1961). *On becoming a person: A therapist's view of psychotherapy*. London, Constable.

13. Schön, D.A. (1987). *Educating the réflective practitioner.* San Francisco, Jossey-Bass

14. Senge, P. (2000). *The Fifth Discipline: The Art & Practice of the Learning Organization*. Broadway Business

15. Senge, P., Otto Scharmer, C., Jaworski, J. & Sue Flowers, B. (2005). *Presence.* London, Nicholas Brealey

16. Vermersch, P. (2006) *L'entretien d'explicitation.* Paris, ESF