

IMPLEMENTING A PEDAGOGY OF INTEGRATION: SOME THOUGHTS BASED ON A TEXTBOOK ELABORATION EXPERIENCE IN VIETNAM

Introduction

A major trend in current pedagogic thinking, and in its corresponding implementing practices, is based on the fundamental concepts of *integration* and *competence*. This evolution is the logical outcome—as demonstrated by a member of our team (Roegiers, 2001)—of several pedagogic trends that have influenced the teaching practices of the twentieth century. In particular, educators have endeavored to respond to the main criticism of pedagogy by objectives, which was that it disintegrates a subject matter into isolated objectives, a process some call—not without humor—the *saucissonnage* (slicing of a sausage). The great merit of pedagogy by objectives is its emphasis on the fact that the student can learn to “do” something, beyond the simple acquisition of knowledge and facts. The risk, however, is that it may lead to learning (mastering) a series of individual know-hows, all equally important but isolated from each other, while failing to form an integrated whole that can prepare the student to cope adequately with real-life situations. Here is where the concepts of competence and of competence and integration fit in.

After establishing a theoretical background on the pedagogy of competence integration, this article presents a case study of a textbook elaboration project in Vietnam, one of many contexts where teachers have traditionally focused on knowledge transmission rather than on competence integration. This case may serve as a model for other textbook revision projects by educators who also favor competence integration over knowledge transmission.

Competence and Integration

After decades of wavering with the concept of competence in education, most authors today tend to agree on the definition of competence as the spontaneous mobilization of a set of resources in order to apprehend a situation and respond to it in a more or less relevant way (Crahay, 1997; De Ketele, 2000, 2001; Dolz & Ollagnier, 2002; Fourez, 1999; Jonnaert, 2002; Le Boterf, 1994; Legendre, 2001; Rey, 1996; Perrenoud, 1997; Roegiers, 1996, 2001, 2003; Tilman, 2000).

This definition indicates that a competence can only exist in the presence of a specific situation, through the integration of different skills, themselves made up of knowledge and know-how. These three elements are essential to develop a competence. For example, to be able “to drive to work,” an individual may have acquired the necessary skills (he/she knows how to shift gears, slow down, assess distances...) but not attained the required competence because these skills are not integrated. If he/she lacks one of the required skills, he/she will be equally incompetent. In short, the person may be competent in a specific situation (i.e., driving

under normal conditions), but incompetent in a different one (i.e., driving in snow-covered roads).

After De Ketele (1996), the following formula can illustrate the components of competence:

$$\begin{aligned}\text{Competence} &= \{\text{capacities} \times \text{content}\} \times \text{situation} \\ &= \{\text{objective}\} \times \text{situation}\end{aligned}$$

In the equation of De Ketele, we add accodances { }, to insist on the fact that it is about an integrated unit. To master competence, it is not enough that the objectives are juxtaposed; it is necessary that they interact to form a unified whole. The use of the sign “x” goes in the same direction: it is enough that one of the terms has a zero value so that competence is null. In short, an objective is the exercise of a capacity (or activity) on contents—for example, to trace (capacity) two perpendicular lines (content).

An education focused on learning (mastering) competences, as opposed to the simple juxtaposition of skills, is requisite for the implementation of pedagogy of integration (Roegiers, 2001). The goal of such pedagogy is to enable the learner to master those situations he/she will have to deal with in his/her professional and/or private life. To this effect, pedagogy of integration has four objectives:

- **Making sense of the learning process**, by placing the learning process within a meaningful context that makes sense to the student in relation to the real-life situations he/she needs to face in life.
- **Differentiating matters by relevance**, focusing on the important, either because it is necessary and practical for daily life, or because it may become the basis for future learning.
- **Applying the learning to practical situations**. This means not just filling the student’s head with knowledge, but teaching him/her to relate the learned material to values, such as becoming a responsible citizen, a competent worker, an independent individual. The student will consequently be evaluated within a complex scenario (Roegiers, 2004b).
- **Associating the learned elements**, and thereby responding to one of society’s major challenges, which is to provide a child with the capacity to mobilize his/her knowledge and skills to deal effectively with daily situations, and hopefully even with unexpected ones. This fourth objective is based on the close interlinking of the preceding three objectives (process, relevance, and application).

Some Background: Two Schools of Thought About the Pedagogy of Integration

This is not the only way pedagogy of integration has been seen and developed by different pedagogical communities throughout the

world. In fact, there are at least two clear schools of thought about the subject. Their main differences relate to the emphasis given to either vertical or horizontal transfer of achievements. This is not a new debate and was initially proposed and developed by Gagné in 1962. The vertical transfer proposes that a student is not able to learn higher-order skills without the previous mastery of their elements (Gagné, 1962; White & Gagné, 1974). The horizontal transfer, on the other hand, proposes that by solving several similar-level complex situations, provided they are presented in different contexts, the students learn to transfer.

In more recent years, this debate has continued. Anglo-Saxon experts have mainly proposed an approach based on the idea of performance and student achievement. This school of thought emphasizes the importance of the vertical transfer of contents more than any global integration within the class (Anderson, Reder, & Simon, 1996, 1998). On the other hand, within the French-speaking school of thought,¹ there are two perspectives on the subject. Even though everyone agrees that the “learning situations” are the center of the educational process, in the two coexisting views inside this school of thought, different importance is given to the timing of these integration situations and their place in the whole learning process.

For one of these two French-speaking pedagogical views, the importance of teaching the student to learn through complexity will be mainly developed through ongoing “active” methods. The transfer effort here is achieved in a global way and needs little structuring (Fourez, 1999; Jonnaert, 2002; Jonnaert & Masciotra, 2004; Legendre, 2004; Meirieu, 2005; Meirieu & Develay, 1992). In other words, the main idea here is to confront the child with a meaningful situation to make him mobilize the skills he has, or is learning, all throughout the process. The focus is on the process of learning and applying the know-how and other elements in permanent confrontation to meaningful situations, i.e., search for information, analyze information, explain information. It is what one of us calls “learn to dive before to swim” (Roegiers, 2005). Its aim is to teach the student through the use of complexity based on a global and non structured horizontal transfer of achievements.

The second perspective in the French-speaking pedagogical community is the one based on a more structured transfer, which highlights the link between the different levels of complexity and the need for integration as well (Péladeau, Forget, & Gagné, 2005). This proposal is focused on the expected final profile of each student rather than on the process itself (De Ketele, 1996; De Ketele & Gerard, 2005; Gerard, 2005; Miled, 2005; Roegiers, 2001, 2003, 2004b). It aims at a structured and useful utilization of the integration situations. In fact, there is a structure to the learning path proposed and a specific timing in which these integrative situations should appear. They are not an ongoing school activity, like in many experimental schools of the previous view, but rather emerge at “key moments” to integrate the learned elements.

In this second approach, there is first a vertical transfer of contents and resources that is led and organized by the teacher and will normally follow a cognitive complexity schema. In a second moment, and not before

the previous content-transferring process has been successfully achieved, integration situations appear to facilitate the horizontal transfer in specific contexts. These specific moments are called “integration week(s) or module(s)” and are proposed every five or six weeks of regular classes, the latter taught in a more or less “classic” way depending on the teaching style of the teacher. In the “integration weeks” the student is confronted with a series of integrative activities or situations aiming to help him/her transfer, acquire, and keep the contents, know-how, and resources learned in the previous weeks.² The integrative situations can be presented in an individual or small group-solving format for practice purposes, even though, eventually, students will all be evaluated individually.³

In a schematic manner, the different approaches may be depicted as in Figure 1:

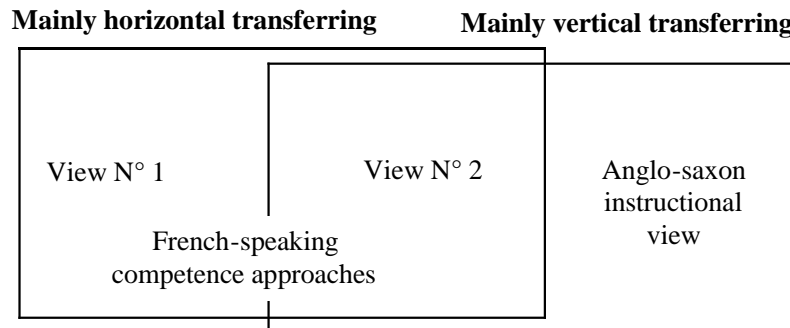


Figure 1: Main schools of thought and transfer emphasis.

Some Relevant and Practical Consequences

Knowing that one of the main possibilities and problems of any pedagogical reform or change is the resistance of the stakeholders involved, namely teachers, this last implementing proposal allows certain changes to take place at their own pace. In this last approach, based on an articulated integrative combination of both vertical and horizontal transferring (View N°2), the importance of the role of the teacher, the respect for his/her particular pedagogical practices, is not, at first, undermined. This is true at least in the first, more decisive educational reform or change stages. Teachers can, and do, continue to teach the way they are used to those first five or six weeks, whereas only the “integration module” is really new.

Even though within this competence approach these new integration modules are imposed, they should not represent a threat, neither to the teachers’ authority nor to their identity. Their identity and legitimate role in the classroom is not questioned, each one developing the transferring part of the process in their own way.⁴ Moreover, the cognitive objective of complexity acquirement through a vertical transferring device is also assured given the fact that there is an important part of the whole process allocated to that aspect. Thus, the learning process of higher-order skills

takes place in a specific, oriented manner and the integration of these skills and resources is provided by more global, general, and meaningful integration modules.

Needless to say, these are brief ideas that point out the practical and concrete possibilities and obstacles that such a reform sometimes confronts. An educational reform based on the competencies approach should consider not only methodology and integrative situations-based pedagogy, but also adequate teacher training and textbook development. Only the coordination of these several elements can assure a successful and sustainable reform.

Having seen and reviewed the main differences in the articulation of some elements of the pedagogy of integration, the goal of the second part of this article is to illustrate—through a specific example—the practical possibilities and difficulties that such an implementation entails. The following case study is based on our experience in Vietnam, concerning the elaboration of a school textbook under the pedagogy of integration logic. But first, we present some preliminary comments on the nature and potential of textbooks.

A Textbook: An Obstacle to Implementing the Integration Approach?

The traditional textbook image is just about the opposite of the integration concept. In fact, most people—teachers, parents, students, even authors—used to consider textbooks foremost and almost exclusively as a means of knowledge transmission. In this context, it would suffice for such a textbook merely to state a number of content-matters, one after the other, for the student to assimilate them by simply memorizing and/or learning through a series of more or less similar exercises.

Knowledge transmission is, of course, a function of textbooks, but they can—and must—fulfill other functions if they are to help in the integration of skills. A textbook can pursue seven different yet complementary functions (Gerard & Roegiers, 2003).

Learning-related functions:

- Knowledge transmission, e.g., communication of information to the student
- Development of skills and competences, to help acquire methods, attitudes, working and living practices
- Consolidation of achievements, via exercises
- Evaluation of achievements, not only to certify actual mastery, but also, from a formative point of view, to diagnose difficulties and recommend corrective actions

Functions related to domestic and professional life:

- Assistance with integration of achievements, so that the learner can extend his/her achievements to situations different from those faced during training

- Reference, i.e., to become a source of information for the student
- Social and cultural education, including achievements related to behavior, personal relationships and social life in general

A textbook pursues several of these functions in a more or less clear way. Thus, a textbook oriented primarily to knowledge transmission will perform mostly as a reference function, and certainly as a tool of social and cultural education in the long run. It will be mainly oriented to reinforce vertical transfer of knowledge. If it also introduces practical exercises, the consolidation function may be achieved as well as the possibility to be used more as a horizontal transfer tool.

From a pedagogy of integration point of view, a textbook should primarily pursue the function of development of skills and competences, as well as contribute to the integration of achievements. It should be recognized that if such a textbook exists, it is in a minority of cases. Here is at the same time a great research opportunity and an interesting ground to build from!

Case Study: The Elaboration of a Textbook in Vietnam

Background

From a quantitative viewpoint, the matter of textbooks in Vietnam is adequately developed. Textbooks are edited by the Education Publishing House, an agency of the Ministry of Education and Training (MoET). Every year, the Vietnam Education Publishing House issues 1,500 different textbooks, covering the whole school cycle and all topics, for a total edition of 90,000,000 units (Gerard & Roegiers, 1997). For the most part, these textbooks are written by authors from the Vietnam Education Publishing House, or from the Educational Sciences National Institute. According to officers from the Vietnam Education Publishing House, the textbooks' pedagogic quality needs improvement in two aspects:

- On the one hand, current textbooks are almost exclusively oriented to knowledge transfer, with no links or relations among them;
- On the other hand, there is a textbook for each topic for each school year, a fact that does not facilitate creating links among the disciplines and, moreover, leads to a plethoric multiplication of textbooks.

In this context and within the framework of its co-operation program with Vietnam, in 1995 the European Commission⁵ assigned the *Bureau d'Ingénierie en Education et en Formation* (BIEF, or Education and Training Engineering Bureau, in Louvain-la Neuve, Belgium) with the mission to help develop a textbook implementing the principles of pedagogy of integration. The Vietnam Education Publishing House opted for a textbook *Awakening Integration in Social and Natural Sciences*, for the 4th basic grade (Dao et al., 1996). The choice was based on the fact that these

topics were covered in an experimental program, with an outline of integration of disciplines. In fact, this program includes natural sciences (physics, chemistry, biology) as well as “social” sciences (history and geography). Nevertheless, these topics remain partitioned—both in the program and in the schedule organization, and if the program includes general objectives in terms of know-how and knowledge, it is essentially structured based on the content to be transferred.

The textbook drafting process was entrusted to a multi-disciplined team comprising a chemist from the Research Department of the Education Publishing House, as team coordinator, and three researchers (a biologist, a geographer, and a historian) from the Educational Sciences National Institute.

Integrated Textbook on Social and Natural Sciences: A Challenge

The initial approach was to increase the program’s integration perspective. It was not a matter of fully redesigning this experimental program, but to reinforce and increase its scope of integrated development of skills and competences.

In essence, this task has fine-tuned the general objectives in terms of know-how and knowledge, and has structured the program in terms of five core skills to be developed, plus the corresponding discipline. These five core skills stem from the typology of intellectual processes defined by D’Hainaut (1983) and may be considered essential in the development of a scientific approach. They are:

- being curious, asking questions
- seeking information (investigating)
- processing the information
- communicating the information
- acting upon, realizing the projects

Introducing these capacities is interesting insofar as it enables the program to have the two elements needed to define an objective, since—as stated earlier—an objective is the exercise of a capacity upon content.

Definition of Core Competences and Objectives

On the basis of this analysis, the team then defined the core competences to be developed in the textbook. These core competences aimed at integrating different fields and the contents of the program, and were associated with a type of situation. Five core competences were thus defined, with the fifth one formulated as follows:⁶

From a real-life experience or from a drawing depicting several health-related problems, the student should be able to identify them, recommend adequate solutions, both curative and preventive, and relate them within an environmental perspective.

The informed reader may think this is only one set of teaching objectives in the classical sense of the word. But remember that a competence is an integrated set of objectives that enables responding to an integrative situation in a relevant manner. In order to master this competence, the student will need to acquire a series of capacities (identify, recommend, associate) to be applied to the content (health-related problems, preventive and curative solutions, environment,), vis-à-vis a situation (presentation of a real-life situation, a complex drawing, or another support).

The objectives that form the competences are shown in a specification table, such as that proposed by Bloom, Hastings, and Madaus (1971). A specification table shows the objectives that form competence. This is a double-entry table crossing, on one hand, the skills, or capacities, necessary to master a competence with, on the other, the contents, or content fields, upon which these capacities are applied. For example, Table 1 depicts the specification table that was defined for the fifth core competence.

Table 1

Specification Table of the Fifth Core Competence

Capacities	Contents				
	Light, water, air, and minerals	Plants and animals	The human body	Nature and the Vietnamese person	Vietnamese history
Being curious, asking questions	2. Explain what would happen to man if there were no light, water, air, or minerals (salts).	1. Identify what makes a plant or animal healthy or unhealthy, and what its needs are.	3. Explain what happens when someone is sick.	8. Explain, from geographical and/or historical elements, why it is important to live and dwell within a community.	
Investigating	4. Investigate how the human body can benefit from these external elements (living and inanimate) and from exchange with the environment.			9. Investigate if hygiene and health conditions are the same everywhere.	10. Investigate if hygiene and health conditions have always been the same.
Processing information	7. Explain what is necessary for man to keep in good health, at the level of these elements and of the human body (pollution-free environment, hygiene, a healthy diet...).		11. Explain what happens in the human body, particularly at the nervous system level.		

(continued)

Table 1 (*continued*)

Capacities	Contents				
	Light, water, air, and minerals	Plants and animals	The human body	Nature and the Vietnamese person	Vietnamese history
Communicating information	5. Make a diagram showing the exchange between the human body and the environment. 6. Make a diagram depicting the relationship in nature between organic and inorganic elements, and among organic elements.				
Acting, realizing projects	12. Develop posters with the 10 basic hygiene rules (researched by the students), and post them at school, the neighborhood, the village....				

Note. The objectives 1–12, when achieved, form the fifth core competence by developing and applying these capacities to these contents. The wording of each objective illustrates only imperfectly the bond with the capacity concerned. Thus the verb “to explain” is connected at the same time to the field capacities “being curious, asking questions” and with “processing information.” It is, of course, the manner of implementing each objective which makes it possible to develop one or the other capacity.

This specification table—whose level of difficulty should not be underestimated by its simplicity—shows how developing core competences requires the integration of the various skill fields aiming in that way at various fields of contents. Indeed, to master competence, the student will need to perform a series of activities to help him/her master the skills of the different fields bearing on the contents of the various fields.

Likewise, the specification table also helps in the organization of the textbook’s sequence. The numbers place the objectives in sequential order according to a pedagogic teaching logic. “Stages of competence” were also defined for each competence—on the basis of a logical as well as pedagogic analysis—in order to increase the integration period. For example, for the fifth competence, the six prime objectives form a major stage of competence.

When this task was completed, the authors defined the ultimate integration objective.⁷ Indeed, the mastering of core competences should not only be achieved individually, but also in an integrated manner. In other words, the wholeness of competences should be the ultimate integration objective, as defined by De Ketele, Chastrette, Cros, Mettelin, and Thomas (1988). The term “ultimate” means that the intention is to develop a synthesis for a full year or a full cycle.

The ultimate integration objective for the *Awakening Integration in Social and Natural Sciences* textbook was defined as follows. By the end of the fourth primary year, the child should be able to:

- Describe a situation relating to his/her local or regional environment with the use and support of charts, tables, diagrams, containing: some geographical characteristics (climate, relief,

pollution), some human characteristics (economy, social organization, hygiene, human biology, historical elements), and some natural characteristics (plants, animals, minerals).

- Describe how some of these characteristics interact.
- Explain some of these characteristics in relation to past events, showing their importance for the Vietnamese people.
- Explain, through examples, how people can intervene to improve upon these situations.

Ideally, the ultimate integration objective should be defined before, not after, defining the core competences. It should be included in the program, developed from an integration standpoint. When such is not the case, it is advisable to define it in the textbook. The components of this ultimate integration objective were confronted with the five core competences to determine the extent to which their development allowed for its achievement.

Sequence Development

The textbook *Awakening Integration in Social and Natural Sciences* was then divided into six modules, corresponding to the five basic competences and the final objective of integration. Each module itself was divided into “sequences” that each approach a particular objective. These sequences cover one to three work periods in the classes.

When this particularly difficult task was completed, the main textbook design was done by elaborating sequences respecting the work structure. To that end, each objective was developed within one or more sequences. For example, Table 2 shows how the initial sequences for the fifth competence were structured.

Table 2

Sequence Schema for the Fifth Core Competence

Core competence: From a real-life situation or from a drawing showing health-related problems, the student should be able to identify them, recommend adequate preventive and curative solutions, and relate them within an environmental context.	
Objectives	Sequences
1. Identify what makes a plant or animal healthy or unhealthy and what it needs.	(1) What plant does it need to live and develop normally? (2) What animal does it need to live and develop normally?
2. Explain what would happen to man if there were no light, heat, air, or mineral substances (salts).	(3) What does man need to develop normally?
3. Explain what happens when someone is sick.	(4) How do we feel when we are sick?

(continued)

Table 2 (*continued*)

Objectives	Sequences
4. Investigate how the human body can benefit from these external elements (inanimate and alive) and from exchange with the environment.	(5) What does the human body use from the environment, and what does it reject from it?
5. Draw a diagram showing the exchange between the human body and the environment.	(6) What is the metabolism scheme between the body and the environment?
6. Draw a diagram depicting the relations in nature between organic and inorganic elements, and among organic elements.	(7) What is the place of the food chain scheme in nature? (8) Based on a drawing, identify health-related problems.

In sum, this textbook design process was about the pursuit of one “table of contents” organized according to competences. This would be meaningless without implementation of the sequences where the skills and competences will actually be able to develop. Essentially, each sequence contains a research activity drawn from all sort of documents, containing precise instructions. This intends to mobilize the student into an active process, individually or in small groups. Depending on the sequence, this introductory activity may be accompanied by a group discussion, structuring information, a summary, a game, questions that make the student evaluate his/her achievements, or complementary information.

This sequence structuring process facilitates the development of skills—that is, the progressive advancement towards achieving the objectives. But to develop the competence, it is still necessary to integrate them (the objectives). In addition, a sequence of integration is proposed after a certain number of objectives, forming a “competence stage.” For example, sequence 8 of module 5 proposes a drawing, from which pupils must identify several health-related problems.

Discussion

Is it Necessarily a Contextual Procedure?

For the Vietnamese education system, this textbook development process represents an almost revolutionary innovation. During the 1996–1997 school year, the *Awakening Integration in Social and Natural Sciences* integrated textbook was tested in several Vietnamese classrooms. A preliminary evaluation (Gerard & Roegiers, 1997) revealed the relevance and effectiveness of this pedagogic procedure, while simultaneously displaying feasibility difficulties in the Vietnamese context, as well as hints for the textbook’s improvement. Responsible parties from the National Institute of Educational Sciences were particularly insistent on the need to “Vietnamize” the ideas underlying the textbook’s conception, both in its vocabulary and its approach to some concepts. This is about a major need to ensure the survival of the process, before even imagining its generalization.

It is particularly important to be aware that—whatever the context of a reform—the “entrance” by means of textbooks is not enough. Even when experience shows that textbooks are one of the most effective means to renovate an educational system (Braibant & Gerard, 1996; Mingat, Tan, & Sosale, 2003), it also indicates that textbook revision cannot be separated from reflection on curriculum and evaluation, not to mention on teachers’ training. The link with the curricula is particularly important: how can we develop textbooks that do not consider the official programs, or that may even be in contradiction with them? This was a permanent concern in the project’s life, insofar as neither the concepts of skill or competence, nor that of integration, are included in the current *Awakening Integration in Social and Natural Sciences* program. In order to privilege the essential over the accessory, the process required making some choices. It was with great relief that the authors received the results of the preliminary experimental stage indicating that the textbook did, in fact, include the official program objectives.

It must also be recognized that this process is a true culture shock. This is evident in a country such as Vietnam, where—as stated by the chief editor of the Vietnam Education Publishing House at the closing of the course evaluation seminar⁸—until then, educators had been more concerned about what needs to be taught than how to do it. Vietnamese educational practices are founded on transmitting knowledge and expecting the student to be able to reproduce it. In this context, the teacher is foremost one who explains the topic and makes demonstrations. The experimental application of the textbook had therefore an upsetting effect: a “material” upsetting because school benches had to be redistributed to allow for team work, and a “pedagogic” upsetting because—as they themselves admitted—the teachers had to change into “organizers” and “discussion moderators.” After a month’s experience, they also noted that students were reluctant to work under the “old” method, even when this applied for other subject matters.

These changes in teaching practices are not always easy, and the Vietnamese experience is certainly no exception.

Can a Textbook Favor Competence Integration?

This experience seems to indicate that it is feasible to design a textbook oriented to the integration of competences. Such a textbook can be analyzed in terms of the four aforementioned integration pedagogy objectives.

Making sense of the learning process. Throughout all sequences, the student is confronted with actual, real-life situations to which he/she is expected to react. The textbook continues to be a substitute for reality. It should not be forgotten, also, that rarely can a competence be exercised in a classroom. The school prepares the students for mastering (learning) the competence, but seldom can it mobilize, and to an even lesser extent, evaluate them. The school continues to be the par excellence place to ‘pre-

pare for life,' but never 'real life'...(Gerard, 1997). However, a textbook can have as a goal to be as close to reality as possible, presenting meaningful situations, that require the student to react to them either by analyzing, transforming, making sense of, or assuming something about them.

Differentiating the essential from the less important. One of the major difficulties encountered by the authors was to identify and select the truly relevant content matters. This was particularly the case with History. The official program is built chronologically, and—it must be recognized—is based on a war logic, or rather on a logic of occupation,⁹ that includes all events and all characters that participated in Vietnam's independence fight. It was very difficult to approach the historical aspects from a thematic scope: for example, which were the events or characters that took Vietnam to its current level of prosperity?

We were able to develop the textbook from an integration viewpoint, and, therefore, to choose "historical" options, because the group member who was a historian was convinced of the importance of these choices. However, there were several reactions of clear reserve to the experimentation—we were dealing with an almost sacred subject!

Practicing pedagogy of integration implies the need to make choices; and even if this principle is evident in theory, it is not so at a practical level, because—ultimately—the question to be asked is: What is really important? Further more, under which criteria? An evident subjectivity does intervene at this level.

Learning to apply knowledge to practical situations. A textbook on *Awakening Integration in Social and Natural Sciences* is particularly suitable to this objective. Helping the student to elaborate about pollution problems, health matters, and the economy, helping him/her to identify environmentally sound solutions, and helping him/her to react in a concrete manner to change his/her context are the privileged objectives of a course on discovery. But pedagogy of integration should pursue this goal through the so-called "classical" subject matters, while simultaneously implementing "transversal," or integrative, activities so as to confront "classical" knowledge with reality.

The first aspect, based on the "classical subject matters" is addressed when—for example—a math textbook requires that the student determine if a child should stay at school or go home at lunch time (Gerard & Roegiers, 2003). To solve the problem, the student must take into consideration economic and even nutritional criteria, and must also look at it from a value system level. There are no absolute "good" answers. Isn't this "applying knowledge in a situation?"

The second aspect, the transversal or integrative activities include the many activities that help a student to approach a situation as a whole, place him/herself in it, and identify alternative actions by resorting to learned information related to other fields, using mostly transversal skills and competences. An interesting case is the development of activities that pursue the goal of opening up to humanness, without limiting them to a 'moral' or "religious" discipline, but by approaching this research within

the traditional curricula. Susan Fountain's *Education for Development* (1995) is a good example of this approach.

Linking the learned concepts. The *Awakening Integration in Social and Natural Sciences* textbook developed in Vietnam is a tool that takes this problematic to its limits. Indeed, this textbook not only helps the student to develop links between various concepts, but these concepts are so basically interrelated that the disciplines are successfully integrated. At no time does the student (or even the teacher) know if this is history, geography, physics, chemistry, or biology. These distinctions are of no importance insofar as what really matters is to approach an actual situation, analyze it, and create a response to the identified difficulties, by resorting to the whole series of knowledge and capacities.

This pedagogic situation is certainly extreme. It can be explained by the fact that Integration of Social and Natural Sciences is an ideal subject in the development of "interdisciplinarity," a concept originated in science (Lenoir & Sauvé, 1998; Maingain, Dufour, & Fourez, 2002). In order to develop competence, to integrate knowledge, it is not absolutely necessary to integrate all disciplines, although doing so provides clear and varied opportunities to develop competences (Roegiers, 2004a).

If subject matter integration is not implemented at all cost in order to integrate knowledge, it is indispensable to stress the development of competences that enable students to confront situations of varied complexity, actual or simulated, that require interrelated mobilization of the acquired skills. This can be done not only through a textbook on Integration of Social and Natural Sciences, but also through textbooks on native language, mathematics, foreign languages, etc., at all levels.

Is it a Widely-Applicable Process?

Is this procedure liable to become general? We are far from thinking that all textbooks should be developed according to the model described here, since a textbook should also, and foremost, correspond to its author(s)' actual project. It is, however, necessary to emphasize the importance of competence development over the simple acquisition of knowledge.

There are several ways of achieving this objective, and the means to develop skills and competences, as well as to assist in the integration of achievements, are also multiple. Two elements, however, are worth mentioning:

1. The concepts introduced to the Vietnamese authors were entirely new to them. Indeed, what was truly innovative was the practical procedure used to implement the theoretical concepts. Once the procedure was introduced, the authors were able to carry on with relative ease, in interdisciplinary teams and with great satisfaction. This leads us to think that this process can be easily transferable to many situations.

2. All Vietnamese colleagues involved in the project, both from the Vietnam Education Publishing House and the Educational Sciences National Institute, were unanimous in expressing their desire to extend the process to all textbooks, not only to the *Awakening Integration in Social and Natural Sciences*, but also to disciplines such as Vietnamese and mathematics. They also expressed, and with reason, the need to “Vietnamize” the process (Gerard & Roegiers, 1997).

For teachers, these textbooks become a chance to evolve in their teaching practices in at least two ways: on the one hand, these textbooks offer concrete tips in how to decompartmentalize their teachings, often still enclosed in a disciplinary logic; on the other hand, such textbooks give concrete examples of integration situations, which can be sources of inspiration for integrating other disciplines, and, in so doing, sensibly improving the effectiveness of their teaching.

Lastly, it is important to point out the need to leave some degree of openness in textbooks designed from the integrative point of view. We even think that these textbooks should be as broad as possible. It is preferable to conceive them as a support, either to complement or to be used in multiple ways, depending on the specific context. Textbooks should propose situations requiring the contribution of elements from the student or the teacher for their solution. They should stimulate research and use of references. An open textbook is not used in a linear manner, from the first to the last page. It is designed to allow for research and reference in one part or another, according to need. From this perspective, these textbooks are more a starting than an arrival point.

End Notes

¹ We understand French as the French-speaking countries (France, Belgium, Canada, and Switzerland, among others).

² For more details about the integration pedagogy and its methodology, please refer to Roegiers (2001).

³ Initial comparative analyses have already developed in terms of educational equity of the traditional and competence-based approaches (Letor & Vandenberghe, 2003).

⁴ Experience has shown that after this first stage, they progressively start to change their pedagogical practices on their own, to more (inter)active methods.

⁵ The European Commission is the executive organization of the European Union. It is based in Brussels, Belgium.

⁶ We present only one example here in order to illustrate our matter. To situate it within its context, the other four core competencies were: a) From a real-life experience of or from a drawing depicting several pollution-related problems such as water, air, and noise, the student should be able to identify them and recommend adequate solutions to these problems. b) In a map of Vietnam, the student should be able to identify weather information

given by the teacher, such as temperature, wind direction, and rainfall. c) The student should be able to connect specific activities and characteristics of his/her region and explain why he/she relates them. d) The student should be able to describe the human, economic, and cultural characteristics of his/her region and connect them to historical events and geographical conditions.

⁷ Also called the Terminal Integration Objective (TIO).

⁸ This Evaluation Seminar was organized by the Vietnam Education Publishing House, supported by the European Union, and held in Quang Ninh, from the 18th to the 20th December, 1996.

⁹ If the West still thinks the occupation of Vietnam was mainly French or American, it is important to remember that for the Vietnamese, the main occupants have been the Chinese, who dominated them for more than a thousand years.

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