

Instructional Design for Problem-Based Learning

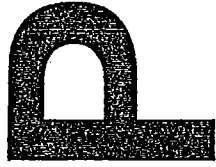
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Editing: Jeroen van Merriënboer
George Moerkerke

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ARM: a project method based on reciprocal animations and multimedia



Véronique Jans¹, Dieudonné Leclercq², Brigitte Denis³, Marianne Poumay⁴

Introduction

The integration issue

Problem Centered Methodologies are known for exploiting the integrating property of problem solving activities. By their multidisciplinary, problems integrate methods and contents. They also integrate mental processes, for instance in terms of Bloom (didactic problems often require knowledge, comprehension, application, analysis, synthesis and judgement). Finally, they integrate learning/teaching paradigms, for instance (in terms of Denis and Leclercq: imprinting, reception, exploration, experimentation, practice and creation).

Project development methodologies also claim they foster the same integrative characteristics. In a large part because Projects generate Problems that, in turn, involve integrated processes.

Along a large range of Project based methods, only one of them will be described: an innovative method called PARM (Projects of Animations based on Reciprocity and Multimedia) designed to train future teachers. Just as PBL applied in faculties of medicine is isomorphic with the general practitioner's professional activities, PARM is similar to teachers' professional acts.

The isomorphism issue

Teachers' professional acts have been described by Gagne and Briggs (1974), in terms of Events of Instruction, as follows:

- 1) Gain the learner's attention.
- 2) Inform the learner of the objectives.
- 3) Stimulate the recall of prerequisites.
- 4) Present the stimulus material (visually, orally, etc.).
- 5) Provide learning guidance.
- 6) Elicit performance.

¹ Aspirant at the National Fund for Scientific Research (FNRS), Belgium.

² Professor at the University of Liège, Director of the STE (Service de Technologie de l'Éducation).

³ Assistant Professor at the University of Liège, in Educational Technology.

⁴ Senior Researcher at STE-ULg.

- 7) Provide feedback about elicited performance.
- 8) Assess performance.
- 9) Enhance retention and transfer.

Then, the PARM approach intends to create a training situation where future teachers can practice these skills in an artificial environment, but with functional characteristics that are similar to reality.

In order to help the learner make sense of abstract issues, the PARM method's 10 steps will be illustrated on an application at the university of Liège where it was applied with 2 groups of 30 graduate students, in a course entitled Audio-Visuals and Learning (given by D. Leclercq).

An example of the PARM method

Step 1: Common initial experience. From the start, students are informed that instead of being "lectured", they will act on both sides (as animators and as "animated" learners) of Multimedias supported animations of a 30 persons group. In order to help students fully understand the objectives and the methods to be put into practice, the teacher plays the animator's role and invites the group (of 30 students) to live 4 or 5 PARM experiences from the learner's side. They are informed that they will be invited to play the animator's roles (preparation, delivery, assessment) on a specified portion of content, inviting, in turn, their classmates to live the experiences they will design for them.

Step 2. Theme selection. Each of the 15 teams (of 2 students) selects a portion of content (they will teach), such as: iconic polysemy, comparative efficacy of media, visual perception processes, etc.

Step 3. A common handbook constitutes the basis for content references, but each team (of 2 students) is invited to investigate additional sources: books, articles, experts, audio-visuals, etc.

Step 4. Students are trained in a presentation software (here, Powerpoint® in the Office 97 version, i.e., offering the possibility to use buttons and hot words). Collective training sessions ensure the basic knowledge and competency. Additional expertises will be learned during the production process (see step 6 hereafter).

Step 5. Scenario conception and content deepening. In order to conceive or fine tune a scenario to animate their colleagues, each team of 2 students has to study thoroughly the chosen theme. This increase in competency will, in turn, influence the scenario, that is submitted to the teacher, in order to be commented, criticized in three respects: the content, the planned interactivities, and technical use of Powerpoint® in relation to the chosen scenario.

Step 6. Multimedia creation and technical deepening. The more advanced the implementation, the more necessary the mastery of the technical solutions. Students, then, consult tutors, mates, handbooks, helps in line, etc. This autonomous learning will be put into practice without any delay (just in time learning). The work process is not linear but iterative, with numerous forward

and backward moves.

Step 7. Animation of colleagues with the multimedia support with a variety of methods. The two animators take in charge a 30 minutes period where they put the attendants into contrasted positions : receptors, respondents, debaters, critics, etc.

Step 8. Allo-evaluation. Just after having been "animated", students read the portion of the syllabus related to the animation, then proceed, as well as the professor and assistants, to allo-evaluation according to a list of criteria, previously agreed by all participants. Here is such a form completed by the professor, for a couple of animators (Magali and Pierre):

Evaluator : Prof. D. LECLERCQ Evaluated animators : Magali and Pierre				
Evaluation criteria				
THEORETICAL ASPECTS				
		Score	Max	Justification - comments (hand written)
1	Contents of animation Relevance - Respect of the book content, no confusion with other concepts. - Completeness of the content.	6	10	- Content is respected (chapter 1, A). - Some errors in the comprehension of GUBA's experiment.
2	Creativity. - Provision of additional data, richness of illustrations.	5	10	- The examples in the book have been exploited. - Insufficient personal research.

Only 2 criteria are illustrated in the example above. The full evaluation form contains 5 aspect:

- THEORETICAL (relevance and creativity about content);
- PEDAGOGICAL (relevance and creativity about the conception of the scenario);
- TECHNICAL (relevance and creativity in the use of POWERPOINT®);
- METHODOLOGICAL (Quality of the planned animation and actual interactivity);
- DOCIMOLOGICAL (Proximity of self-assessment and teacher's ratings; relevance of the student's justifications and comments).

Step 9. Self-Assessment. Animators fill the same form about their own performance, but with the help of 3 animated students (randomly designated), who represent the "consumers' opinions".

Step 10. Exploitation of the evaluations. Each animator can compare his ratings (and justifications) to his colleagues' ones and with the professor's ones. Possible discrepancies (in terms of over or under estimations) are discussed with the professor and his assistants, and allow the student to make decisions about learning and assessment strategies. It also happens that, as a consequence of this confrontation, the professor revises his judgement and even his book.

THE PARM method's basic principles

Three Principles on students-teachers relationships

Principle 1: The Copernican revolution

During centuries, teacher-students interactions were centered on the teacher: he was on a stage, writing on the blackboard, the microphone in his hand, correcting copies with red ink, imposing the time schedule, rating the students performances, etc. In a movement called by Claparède the "Copernican revolution in education", positions have been reversed, i.e. placing the student and learning in the center.

The teacher is not any more

The sage on the stage

But a guide on the side.

Making a step ahead, Mc Keachie *et al.* (1986, 63) state: "The best answer to the question "What is the most effective method of teaching?" is that it depends on the goal, the students, the content, and the teacher. But the next best answer is "Students teaching other students".

Principle 2: New roles for the teacher

The teacher evolves from being data transmitter, toward being a facilitator, a guide, a mediator for learning to happen, for the projects to become successes. It often happens, in this context, that the teacher looks for a solution in the same time as his students. As a consequence, the traditional educative relation is modified since the learners have the opportunity to observe their teacher solve problems and learn a situation that is seldom seen in traditional settings.

Vygotsky has defined the proximal zone of development as what a person is able to realize with the help of a more competent one, opening an area for personal development. In the same direction, Bruner has coined the terms "scaffolding" and "un-scaffolding" to designate this help (and its withdrawal) from the teacher. Nikos Kansantzakis said the same in more poetical terms:

"The ideal teachers use themselves as bridges

Which they invite students to cross

Then, having facilitated their crossing,

Joyfully collapse, encouraging them

To create bridges of their own".

Principle 3: Necessary renunciations

Adopting the PARM approach implies to renounce at least to the following expectations:

Cited by ASSAL (1995).

1. "See all the content". This target is, anyhow, out of reach. Moreover, to "see" is not to understand, and the target in PARMs is deep comprehension. In the same way, a professor of literature must renounce to the idea that, at the end of his course, students will have read all the poems.

2. "Reach perfection". It is preferable to be approximately right than precisely wrong. Little steps in the good direction are better than giant leaps in the wrong one. Methods and tools will be progressively improved, with the help of the students themselves. Anyhow there is not something like the best method regardless of content, learners, circumstances (Schramm, 1977).

3. "Make everybody happy". When students are interviewed about their preferences, in terms of contents, methods, assessments, media time schedules, etc., diversity and incompatibility between opposite views is frequently observed. Therefore, wisdom suggests that the teacher should select a method in which at least she believes and with which she is comfortable.

4. "Take no risks". Changing strategy is always at risk. It has to be taken, relying upon students to give the venture its real dimensions.

5. "Score at each shot". Educational ventures lie at grain of sand's mercy. Experience is as necessary here than in any other venture.

6. "Believe this can be done alone". To animate 30 students in the PARM way, 4 to 6 persons are needed. Typically, the professor and his assistant, 2 proctors (older students), 1 technician, 1 computer expert. This human environment makes possible tailored agendas and time schedules (including working during weekends). The human aspect of educational support cannot be replaced by the technology, technology forces humans to specialize in humanity.

Three principles revisiting learning situations

Principle 4: Situated learning and co-construction of meaning

Collins *et al.* (1989) has stressed the links between cognition and social circumstances of its growth. Billett (1996, 263) insists on the importance of the social usefulness of cognitive acquisitions. This can be illustrated by the way two teams have scenarised the same content, i.e. reliability of eyewitnesses recalls and their influence ability or alterability (Loftus, 1979). One group inserted the issue in the context of a car collision, the animated students being the jurors. The other group inserted the issue in a criminal plot, the animated students being the detectives. Those two scenarios places the theoretical problem into highly significative social contexts.

Principle 5: The propulsors of a project: venture and search

Venture must elicit success. "The economic initiator is a person of "outcomes"; nevertheless, school is centered on errors and lacks. The venture pleasure of success is a feeling far too less experienced in the school universe" (Mesnier, 1996, 68). In the PARM approach, the product will have to be used, to be tested on "consumers", in opposition to methods where a creation (for

instance a CD Rom) has no user. In PARM, the user reactions are a motive for excellence; they offer quality criteria.

The aspiration of students to engage both in venture and in research is illustrated by an incident when we started a PARM course in January 98. Facing 60 students, we first suggested them to organize in teams of 4 students, 2 of which would search for the content in libraries, the two others dedicating themselves to the creation of the scenario and the product. With a dramatic unanimity, the students rejected this proposal, preferring smaller groups (of two) being responsible for everything. They refused crumb work.

Principle 6: Experience, culture and learning

For Clause (1975, 219), "Civilisation is the set of material, moral, spiritual and social acquisitions of a historical human environment; culture is comprehension, reflexion, critical judgement. Culture is a permanent action of the individual's mind applied to the realities of civilisation. Education is the transmission, from a generation to an other, of techniques, civilisation".

We would extend this sentence by "in order to enable the new generation to create its own culture". In the PARM method, students are invited to provide a unique piece of work, to make a "cultural move" in the sense of Clause. As can be seen, divergence (in Guilford's terms) is largely welcome in PARM. As John Kennedy said: "Some look at what is and ask "Why?" Others look at what could be and ask "Why not?"

In a similar way, Aldous Huxley declared "Experience is not what happens to a man, it is what a man makes with what happens to him".

Three principles revisiting the objectives of learning

Principle 7: What is learned is less the content than the process

Knowledge obsolescence makes more and more futile the memorization of facts. Learning procedures and metacognitive acquisitions are of greater interest. The PARM method puts to the fore the development of these processes (transversal competencies) more than on knowledge acquisition (specific competencies). What is mainly learned in PARM, is a way to learn (by creating) and a way to teach (by animating).

Principle 8: The relation to knowledge and the transfer issue

To put the students in a situation of trainer is to delegate to them the responsibility to select contents, objectives, methods and to position themselves about contents: which ones deserve being transmitted, why and how? With PARM approach, it is expected that this reflexive and constructive attitude towards knowledge is more likely to be transferred than factual data. Bruner

(1986) underlines the issue of acquiring such a reflexive attitude facing knowledge:

"If the Youngster does not succeed in developing an attitude of reflexive intervention towards encountered knowledge, he will permanently operate from outside to inside - i.e. knowledge will control and guide him. If he succeeds in developing such an attitude, he will be the one who controls knowledge accordingly to his needs".

Principle 9: Tools to think and act

A real professional can be recognized through his instruments. Besides their expressional functions, media are also research instruments favoring self servuction".

In Vygotksy's (1931) instrumentalist perspective, it is crucial to permit students to master Communication Technologies, these modern tools of thinking and cultural expression. Vygotksy considered (1931, 110) that "the only good teaching is the one that precedes the development, opening new areas to it". Since often in education, the reverse is assumed (learning must wait until development has reached a given level), this could be called "The Vygotksian revolution".

Three principles reinterpreting the act of learning

Principle 10: Confronting ideas

Collaborative learning at university level is particularly on the agenda nowadays for its advantages in terms of motivation and socio-cognitive conflicts. Structured lectures (Gibbs and Jenkins, 1992), Problem Based Learning (van der Vleuten and Wyncn, 1990), the experiment of "Self-managed teams for Cooperative Learning" developed at the University of Quebec at Montréal, (Blondin, 1996), the "Topics Teams" developed at the University of California, Riverside (Kagan, 1985), and Control Technology (Denis, 1993) constitute other examples of this concern that PARM also shares. In the words of the French poet Paul Valéry: "We think as we knock against".

Principle 11: Disorder: a beneficial step?

Piaget has shown how concepts derive from actions. The word "laboratory" reflects this in its semantic origins. And we know that a laboratory is not a museum: it generates disorder. As Latour and Woolgar (1988, 266) state: "Scientific reality is a pocket of order created from disorder. Disorder has to be considered as the rule, and order as the exception". In PARM, the disorder period is concentrated into the conception and realization phases. These phases are necessary to the operation of "majoring re-equilibration" invoiced by Piaget. Just as researchers

¹ Cited by Barth, 1996, 36.

² Servuction is a new french term, coined by economists from Lyon. It means "Production of services". It should be noted that service often involves the beneficiary's participation in the service production, i.e. a certain degree of self-servuction.

and managers, the learners have to live a kind of "hand and brain reconciliation" (Mesnier, 1996, 53). In Victor Hugo's words "At augusta, per angustia".

Principle 12: Provide time for incubation

The common initial experience at the introduction of the course is just a first experience that will be followed by other repeated ones of the same type, often as animated persons, but sometimes as animators. The repetition of (slightly different) experiences of the same kind helps to "mature" concepts and processes. For instance, at the end of the experience of PARM with two groups of 15 teams that lasted from January 98 to April 98 at the University of Liège, several students suggested, in their final opinion questionnaire, that each team should have to produce two PARM, since they have learned a lot from the first one and from the others' PARM.

Discussion

"Nothing ventured, nothing gained" says the proverb. To implement PARM implies to overcome a series of obstacles, the same as those that Barth (1996, 34) enumerates about her method of "Scenario for meaning co-construction". For her, resistance from teachers facing such methods is caused by

1. The conditioning linked to their own school history.
2. The issues about power: the teacher is "the one who knows".
3. An insufficient training in these kinds of methods.
4. The amount of effort requested: it is more rapid to transmit what has to be memorized than to create authentic situations for learning.
5. The lack of valorization from authorities.
6. Implicit theories about knowledge (such as "only experts can transmit")."

In addition to those resistance's shared with the ones Barth described, some are specific to PARM:

7. The amounts of technical (here computer wiseness) investment and of appropriate training.
8. The increase of uncertainty resulting from technical resources: possibilities of breakdown, necessity of double checks, etc.

The famous aphorism "teach as taught" draws our attention on the importance of initial training: As far as teachers have not lived themselves these methods, from the animated persons' side, their reticence would hardly decrease. To overcome the obstacles, to low down the resistances, radical methodological changes have been suggested. PBL is one of them; nevertheless it implies a series of institutional, organizational and even architectural changes. PARM, on the contrary, can fit into a traditional academic environment, with the advantage of being implementable

¹ You can succeed only by overcoming difficulties.

without revolutionizing the institution.

Nevertheless, it constitutes, like PBL, a step towards learner centered education. At least, with the PARM method, future educators will live what they are supposed to help others to live in their turn. We believe that having swum into innovation helps dare to dive in it.

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