THE *SCALE-UP PROJECT*
A TEACHING REVOLUTION FROM THE SOUTH

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Two years ago, thanks to an "Eye on IT" posting on *La Vitrine Technologie-Éducation*,[1] I discovered the work of Robert Beichner, physics professor at North Carolina State University. I quickly realized that this researcher and teacher was going to revolutionize our way of teaching, and that this revolution was already happening, making inroads at the Massachusetts Institute of Technology and also acting as an inspiration to certain Quebec colleges, thereby demonstrating that Beichner's approach can be adapted to a number of different environments. It was not until this past December, however, at a workshop organized by the extremely active James Sparks[2] from the St. Lambert campus of Champlain Regional College, that I finally met the man who is asking us to turn our teaching methods upside-down.

This article is not an account of that meeting, but rather a foray into the "*Active Learning and 21st Century Classroom*" movement launched by Beichner. This short presentation on the principles of his approach and the success it is experiencing may give some of us cause to explore this promising avenue further, and see how it could be more widely adapted in Quebec's colleges.

A STARTING POINT

Our students neither learn as much as we would like, nor not take as much of an interest in our courses as we would like. It was this observation, combined with the fact that his classes contained some 100 students, that more than ten years ago inspired Robert Beichner to completely transform his teaching methods, via the *SCALE-UP* ("*Student-Centered Active Learning Environment for Undergraduate Programs*") *project*.

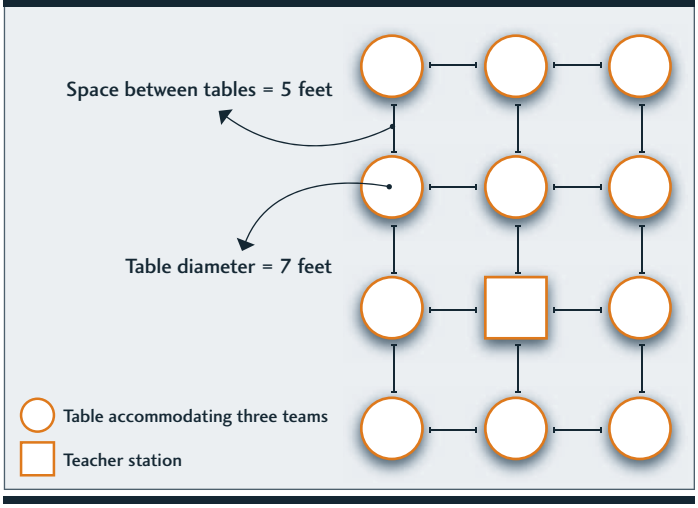
WHAT EXACTLY IS A *SCALE-UP* COURSE?

By and large, a *SCALE-UP* course is based on a socio-constructivist learning design, and involves a collaborative approach in which students question and supplement what they have learned, as well as their skills, via interaction and teamwork to which each individual contributes. A *SCALE-UP* course also makes use of problem-based or project-based learning, and relies on information and communications technologies (ICTs) to ensure that students prepare for each class.

PHYSICAL LAYOUT

SCALE-UP classrooms are completely different from traditional classrooms (Figure 1). Three teams of three students each sit at a round table. Each team has a computer connected to the Internet (to access information), and each student is given a name tag (with a view to putting an end to the anonymous nature of large classes). Each table is exactly seven feet in diameter. Beichner's research into table geometries taught him this was the perfect size: with six-foot-diameter tables, students are too close together to spread out their documents around the computer, whereas with ten-foot-diameter tables, too much space is wasted in the middle of the table, and teams are too far away from one another to communicate effectively. Tables are spaced five feet apart, allowing the instructor to easily move about from one team to another. The teacher station is located in the middle of the room. Is this design all that important? It took Beichner only one experiment with collaborative work involving students in a traditional amphitheatre, with fixed tables and seating, to conclude that it was an absolute "must." He describes that event as the "worst teaching experience ever!"

FIGURE 1
IDEAL LAYOUT OF A *SCALE-UP* CLASSROOM



[1] This "Eye on IT" posting by Raymond Cantin offers an interview with Robert Beichner [http://ntic.org/dossiers/la-salle-de-classe-du-21ieme-siecle/].

[2] James Sparks hosts a Website containing a host of relevant information on active learning [http://activelearner.ca]. He also sends out regular updates on the subject to people on his mailing list. To sign up, just send an E-mail message to: [jsparks@champlaincollege.qc.ca].



HOW A SCALE-UP CLASS IS CONDUCTED

In these classrooms, which have little in common with traditional rooms, a typical class goes like this: First, it is the students' responsibility to learn the basic material by reading or gathering information outside the classroom; this leaves more time in class for them to properly grasp course content. To motivate students to explore that content and prepare for the next session, the instructor uses such tools as *WebAssign*,[3] an online problem-delivery system. This system gives each student a different assignment, in keeping with course content.

Once in the classroom, the instructor takes a few minutes to introduce various concepts and, more especially, to give the teams problems or questions; the teams then work on different aspects of the problem, although all are interrelated. This step is crucial if students are to properly understand the work to be done. Accordingly, the questions they ask the instructor subsequently will not bear on what is expected of them, but rather on course content. The three-person teams then commence working. Class-wide discussions may arise during this period, but eventually students resume working in teams.

During this period of activity, each team uses a small whiteboard with an erasable marker to post its work. Students use bigger letters, and the instructor can more easily read these notes than if they were written on paper. The use of the whiteboard also forces students to work together: no one can opt out of the group or hide behind his or her work! In more "high-tech" *SCALE-UP* classrooms, the erasable whiteboard is replaced by an interactive whiteboard (IWB). In this case, the instructor has a control panel, and can display one team's work on all classroom IWBs, as well as pointing out successful efforts or problems encountered. The IWB thus becomes at once a work area and a "public thinking space."

While the students are working, the instructor moves around the classroom, observes what the students are doing, asks questions, makes comments to steer the teams in the right direction, informs the entire group of the questions or strategies of a given team, and so on. Where a team is unable to answer its questions, it consults the two other teams at the same table. If no one is able to answer, the three teams consult the instructor. The latter may ask the students at the same table to exchange and comment on their respective assignments. At the end of the class, the instructor speaks again for a few minutes in order to review the problems assigned to the students. In short, in a *SCALE-UP* classroom, the instructor becomes a true facilitator and director of learning, while the students are its main architects.

EDUCATIONAL DESIGN

In the *SCALE-UP teaching/learning model*, the instructor starts by identifying the performances or skills expected of the students, then develops assessment methods to measure whether objectives have been met or skills developed, and lastly designs the required learning activities. This approach involves a transfer of power from instructor to student. Students do not merely passively absorb the content taught by the instructor: they discover this content by means of the reading they do outside the classroom—reading they "re-invest" in the problems, projects, or questions developed by the instructor. They mobilize team knowledge, whether available via the Internet or from the other teams in the class. This is what Beichner and other authors, especially Lage, Platt, and Treglia (2000), call "the inverted classroom" or "upside-down pedagogies"—an approach many instructors are already implementing in Quebec colleges. The approach also involves frequent individual formative assessments that are conducted by means of IT, so as to provide each student with opportunities to personally determine the progress made.

TEAMS

In a *SCALE-UP* classroom, teams are established by the instructor. Each team member takes turns playing the devil's advocate, the secretary, and the manager. The instructor ensures that each team includes a weak student, an average student, and a strong student, based on previous academic achievements. To prevent labelling, the students are not aware of the instructor's team-establishment criteria.

In fact, when students ask about such criteria—which does not happen very often—the instructor tells them that choices were made at random by computer. To motivate his troops, Beichner has sometimes resorted to using the "carrot" approach: in his opinion, the best students are often motivated by earning points, while the weakest are infrequently so inclined. The instructor thus suggests giving each team member five additional points if the average team mark is greater or equal to 80%. The strongest students, motivated by the possibility of obtaining a better grade, are encouraged to help their weaker classmates to work harder, and the latter feel obliged to perform. This is reinforced by the fact that team members must draw up a contract enabling them to oust any member who is not making the required contribution. Through interaction and interdependency, the students on the same team are therefore personally responsible for their own learning.

[3] [http://webassign.net/]

IS THIS TYPE OF TEACHING/LEARNING EFFECTIVE?

For more than ten years, Beichner and his team have recorded and analyzed hundreds of hours' worth of courses and compiled student portfolios, and headed up a number of discussion groups, individual interviews, and assessments making use of the pretest/posttest formula. Beichner and his associates have also gathered data allowing them to compare the results and learning outcomes of some 16,000 students, based on whether or not they had taken part in *SCALE-UP courses*.[4]

> *[...]* SCALE-UP *courses have a failure rate almost three times lower than that of traditional courses.*

On the issue of *SCALE-UP efficacy,* the data speak for themselves: students who benefitted from this approach developed their problem-solving skills and their learning of concepts improved spectacularly; their attendance rate was also approximately 15% higher than that of students in traditional lectures;[5] and their failure rate was lower.

In administering the same traditional exam to *SCALE-UP* students and traditional-lecture students, Beichner and his team noticed that the former were better able to solve most problems,[6] and that the areas in which their performance suffered were related to content they had not dealt with in class. At the same time, the performance of the *SCALE-UP* project students did not differ greatly from that of students from traditional "chalk and talk" classrooms who had prepared for that content.

The *SCALE-UP students' understanding of disciplinary* concepts was compared to that of their peers from traditional classrooms using assessment tools widely recognized on the American scene. Once again, the results for *SCALE-UP* project students were higher.[7] In dividing the *SCALE-UP* project students into three tiers, in accordance with outcome, and comparing the progress made by the students in the three groups, Beichner and his team noted that the strongest *SCALE-UP* project students were those who made the most progress.

Even the weakest *SCALE-UP* project students made greater learning strides than their peers from traditional classrooms, although those gains were smaller than those made by their classmates from the upper third of the *SCALE-UP* project. The research team attributed this state of affairs to the fact that, in a *SCALE-UP* classroom, the strongest students are asked to help the weakest on the team by explaining and enabling them to better understand course content.

The research team also compared the failure rate in traditional classes (n = 14,804) and *SCALE-UP* classes (n = 1,150). They established[8] that the failure rate for the *SCALE-UP* classes was almost three times lower than that for traditional classrooms. In some groups of students, this ratio (failure rate in traditional classrooms divided by failure rate in *SCALE-UP* classrooms) was even higher—for example, female students in SCALE-UP classrooms fail almost five times less often than their traditional-classroom peers. Beichner's team also monitored *SCALE-UP* project students in subsequent courses to see how they performed. They found that, once back in a traditional classroom setting, even the most "at-risk" students performed better than their classmates.

THE *SCALE-UP* MOVEMENT TODAY

In the United States, more than 50 colleges and universities have adopted this approach to teach physics, chemistry, math, and literature, to give just a few examples. Elsewhere throughout the world, in particular France, Israel, Australia, and Canada, it has also been implemented by various academic institutions. As Beichner says on his Website:[9]

> "The basic idea is that you give students something interesting to investigate. While they work in teams, the instructor is free to roam around the classroom--asking questions, sending one team to help another, or asking why someone else got a different answer."

Here, in Quebec colleges, the movement is taking wing, with Vanier, Dawson, Champlain, Rosemont, LaSalle, St. Félicien, Montmorency, and Victoriaville colleges all implementing initiatives over the past few years or months. The *SCALE-UP* approach can be adopted at varying rates, in keeping with instructor interest, budgets, and strategies (see sidebars for summaries of the action taken in some of these institutions). One thing is sure: the *SCALE-UP* movement is here to stay, and, given the fact that its results seem convincing, it can only be hoped that it will attract even more attention and become even more popular.

[4] [http://www.ncsu.edu/PER/scaleup.html]

[5] [http://www.ncsu.edu/PER/SCALEUP/Attitudes.html]

[6] [http://www.ncsu.edu/PER/SCALEUP/ProblemSolving.html]

[7] [http://www.ncsu.edu/PER/SCALEUP/ConceptualLearning.html]

[8] [http://www.ncsu.edu/PER/SCALEUP/FailureRates.html]

[9] [http://scaleup.ncsu.edu/]



Readers whose interest in the *SCALE-UP* movement has been piqued by the above description and would like more information can go to the *Pédagogie collégiale* Facebook page and click on the related hyperlinks.

Please note that, on June 4, James Sparks from the St. Lambert campus of Champlain Regional College will be organizing a ped day on active learning, thereby extending a series of events launched in 2010. The day's activities will bear on the theme: "Active Learning: What Next?". For more details, contact James Sparks.[10]

The next AQPC symposium will also feature several papers in English and French related on the *SCALE-UP* project. See you there!

REFERENCES

LAGE, M., G. PLATT and M. TREGLIA. (2000). "Inverting the Classroom: A Gateway to Creating an Inclusive Learning Environment." *Journal of Economic 31* (1), pp. 30-43.

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THE *SCALE-UP* PROJECT CUTS ITS TEETH IN QUEBEC AT COLLÈGE DE ROSEMONT

At Collège de Rosemont, the development and use of an active-learning (AL) classroom took place as part of the retrofitting of the science classrooms. In the spring of 2011, a classroom used for teaching physics theory was slated for renovation, and the original plans called for a traditional layout (with desktop computers). In April 2011, following a presentation on the *SCALE-UP* project by the college's IT educational advisor (ITREP), those plans changed: physics instructors expressed their interest in an AL classroom, and the vice-dean of academic affairs ran with the idea. The college then explored a number of different possibilities, organizing tours of Dawson College and McGill University to see how their AL classrooms were designed. The Rosemont staff chose the model that seemed the simplest and the layout that allowed for the best use of available space. Rather than installing desktop computers on the rectangular tables positioned along the walls, they opted for six round tables five feet in diameter, each equipped with two laptop computers. The teacher station was also equipped with a laptop. Each table can accommodate six students and comes with an erasable whiteboard. There is an interactive whiteboard (IWB) at one end of the room; at the other, a projector connected to the IWB. No matter where they are seated, therefore, students can see what is displayed on the IWB. For the moment, the computers are connected to the Internet by wiring concealed in power poles in the middle of the tables, but the college intends to convert to WiFi in the near future. The approximate cost of redesigning the classroom was between $47,000 and $55,000.

Since the fall session of 2011, the new AL classroom has been in use by three physics instructors, one math instructor, and their 200-some students, for a total of 35 hours a week. To date, only one informal survey of satisfaction with the room has been conducted, but the outcome was extremely positive. Students from at least one program who use the room also expressed an interest in having all their courses implement the collaborative approach made possible by the new amenities. The instructors' only regret involves the dimensions of the round tables: "For 36 students, five-foot-diameter tables are really too small. Seven feet would be ideal," said Louis Normand, one of the physics instructors. "On the other hand, when the groups are composed of only 24 students, the size of the tables is perfectly adequate," he added.

The instructors at Collège de Rosemont have made certain adjustments to the *SCALE-UP* approach. By way of illustration, they generally do not have students prepare in advance, outside the classroom. Rather, to encourage them to get involved in the AL process, the instructors present a problem, either at the beginning of one class or the end of the preceding class. They do not lecture, in part because they advocate problem-based learning (PBL), there is no "front" of the class and, with the round tables, students expect to be involved in discussions rather than listening to a lecture.

The main lesson the teachers learned following the fall session of 2011 was that merely preparing a PBL activity is not enough: to ensure that students learn, become independent, and avoid frustration, they must receive support, especially at the beginning, as described by instructor Louis Normand:

> *The number-one principle is to always start with a problem or task. With guidance, there is progress, and the amount of support needed declines. This fact does not appear in PBL or* SCALE-UP *literature. As students are not used to this type of learning, you have to go step by step: assign a series of tasks over a few weeks, the first being completed by the instructor alone, and the rest giving the students an opportunity to apply the problem-solving process and develop automatic responses. By the end, for the last task, the students are independent. In situations where I've paid attention to this concept, my students have learned in a more in-depth manner. In situations where I've paid less attention, the opposite is true. Furthermore, whatever the results obtained by Beichner and his team, instructors who expect students who take PBL and AL courses—where the emphasis is on collaboration—to do as well as others in traditional assessments will be disappointed: you have to change your viewpoint and your evaluations. With PBL, AL, and collaboration, the learning outcome involves solving complex problems, not passing traditional exams. For my part, I have changed my student assessments, making them similar to the learning situations I propose, but my students must tackle the assessments without support and completely independently.*

Source: Louis Normand, physics instructo [lnormand@crosemont.qc.ca]



THE *SCALE-UP* PROJECT CUTS ITS TEETH IN QUEBEC AT THE ST. LAMBERT CAMPUS OF CHAMPLAIN REGIONAL COLLEGE

Students in the college's biology department have been involved in active learning (AL) for about ten years. The *SCALE-UP* inspired space is a laboratory—a spacious room with four wet labs, a multimedia centre, and four round tables each seating five students. The tables, which feature laptop computers and WiFi Internet access, are far enough apart to allow the instructor to move around freely among the room's 20-odd students. While the tables are arranged so that all students have access to the whiteboard or multimedia screen, because of a lack of space, the teacher station is not located in the middle of the room, as advocated by the *SCALE-UP* approach, but instead incorporated into one of the student tables. Instructors don't view this layout as problematic: not only is the teacher closer to the students, but most students are able to see him or her face-on. Moreover, the station is actually used for only about 10 to 15 minutes while the instructor gives instructions. Since 1999, the AL lab has been renovated twice: initially, the facility was equipped with hexagonal tables and enormous desktop computers, which took up to 80% of the available space. In 2010, using the McGill University AL classroom as a model, the St. Lambert campus revamped its AL lab with funds provided by the Ministère de l'Éducation, du Loisir et du Sport (Quebec's department of education, recreation, and sports) as part of a program to refurbish the province's science labs.

Although each table can accommodate up to five students, for certain activities the instructors prefer that only two or three students work together, in order to facilitate communication and learning. Whatever the size of the team using the tables, the total number of 20 students is just right, as the teachers see it. They can supervise and guide the students in their work while ensuring that everyone is participating. (For groups with more than 20 students, however, a single instructor is not enough.)

To create teams that are as similar as possible, teachers have students fill out a questionnaire on their interest in biology and experience with this discipline. Using the results, the instructors assign a rating (high, average or low) to each student, then ensure that each table has at least one representative from each.

At present, three biology instructors are using the AL lab at least once a week. Some spend up to one-third of the session there, especially for General Biology I and II. In all, more than 300 science students learn in this classroom every year. While no formal effectiveness assessment has been conducted to date, the teachers concerned feel that using the AL lab results in more effective learning, especially because it promotes communication among students, active participation, and peer tutoring. They also see the lab as an opportunity to gear their teaching towards students and promote the "3Ps" approach—problem posing, problem solving, and peer persuasion—in a laboratory environment. In keeping with the 3Ps approach, students are given a problem, help one another solve it, and report their solution to the rest of the class, which then evaluates it. The instructors claim they love the dynamic created in the AL lab, as students seem more involved, less stressed, and less afraid of giving their opinion or telling their teammates whether or not they understand the assignment. However, given the fact that, to date, there is only one AL lab, instructors cannot always use it when they like, and are wondering whether it might be better to set up such labs at the junction of two ordinary classrooms. Via the use of flexible partitions, the AL classroom could accommodate large groups or be accessible to two classes at once.

In the spring of 2011, following a tour of the biology department's lab, instructors from the commerce department decided to gradually convert one of their computer labs to an AL classroom. Because of delivery timelines, the renovations commenced with technology integration, with the 36 desktop computers being replaced by laptops. Instructors who were used to facing a classroom of students and giving traditional lectures were thus able to adapt gradually to the change, and noticed that they had more room, as the premises were freed up from ungainly computers and wiring. Before courses began, a brief training on the technology involved was given to the teachers who would be using the AL classroom; other training sessions have been planned, and will focus more on the pedagogical and philosophical aspects of AL. The instructors also noticed that, even using the rectangular tables at their disposal, students could still work in teams. To facilitate matters, however, the AL classroom was equipped with the usual round tables in January, after the instructors had discussed the exact layout they wanted. In the end, an AL-classroom committee composed of department instructors, the educational advisor and physical-resource and IT staff, elected to create five workstations, each equipped with a whiteboard and a 40-inch flat-screen TV. To reduce the costs associated with connecting the computers to the screens, the committee used a new technology called WiDi (Wireless Display), which makes it possible to hook up laptops to screens for the modest sum of $120 per screen. The committee also decided to install the screens high enough to prevent them from coming into contact with backpacks. (With use, however, it became apparent that the screen should be slanted downward for better visibility.)

SUITE CHAMPLAIN REGIONAL COLLEGE

"It should be noted that, even though the SCALE-UP *project design model is a valuable guide, details may differ in a college context," explained James Sparks, educational advisor and ITREP. "At St. Lambert, for example, some departments have decided to use five-foot-diameter tables and teams of four students, so as to provide a more intimate environment and fewer distractions for younger students. Group size differs between colleges and universities, which may influence the choices made. Budgets also vary. Furthermore, we are not thinking of introducing IWB into our AL classrooms."*

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THE PROJECT *SCALE-UP* CUTS ITS TEETH IN QUEBEC AT LASALLE COLLEGE

At present, this college has one *SCALE-UP* classroom, which is going through a two-phase refurbishment process. In phase one, the physical space was developed (six 54-inch-diameter round tables, seven chairs, and one erasable board per table, plus two projectors). This classroom—called the "collaborative classroom"—was built over the summer of 2011 and inaugurated in October of the same year. Phase two, to take place in the summer of 2012, will involve adding an interactive whiteboard (IWB) and a control panel in the centre of the room. Given that the cost of the completed work, including IWB technology, may reach the six-figure mark, the college decided to perform the work in two separate stages in order to evaluate project cost-effectiveness. This strategy has also made it possible for teachers to get accustomed to the new environment gradually—a fact that explains, in large part, the room's rapid success.

At present, some 15 instructors are sharing the room, in keeping with what is to be taught during a given lesson. Some art history, literature, second-language, marketing, communication, philosophy, and business courses are given here. To date, the college has not conducted a formal assessment of the room's efficacy, but in team-leaders' meetings, its relevancy for technical programs has often been mentioned. Because these programs frequently require teamwork, which is facilitated by the classroom design, students save time, as they can get to work as soon as they sit down, and their motivation is enhanced simply because they are in an environment that promotes collaboration, which, in turn, has a major effect on learning depth and quality.

Another *SCALE-UP* classroom, to be built for the fall of 2012, will be used by teachers with fewer technical requirements; although the standard *SCALE-UP* layout will be used, IWB technology will be missing. Thanks to the assistance of an educational advisor, teaching workshops and other training sessions will be given with a view to promoting these classrooms to the academic staff.

Source: Mathieu Lépine, pedagogical support coordinator
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THE PROJECT *SCALE-UP* CUTS ITS TEETH IN QUEBEC AT THE CÉGEP DE SAINT-FÉLICIEN

For the time being, only one classroom at this college has been redesigned as a *SCALE-UP* classroom. It contains nine five-foot-square tables that can each accommodate four students and as many laptop computers. The room is also equipped with two giant screens that act as interactive whiteboards. The instructor has a touch-screen computer and Active Vision presentation software, including pencils, highlighters, and other tools for use with the giant screens. Another program installed on this computer, called Insight, makes it possible to conduct polls (somewhat as with televoting devices, or "clickers") and manage students' laptops, whether for purposes of monitoring or sharing students' screens with the entire class. The DECclic teaching platform is used to exchange documents, drills, and exercise modules. All in all, the process cost approximately $45,000.

This multipurpose classroom was developed as a result of a project conducted by math instructors Hélène Beaulieu and Jocelyne Guénard,1 who wanted to experiment with problem-based learning (PBL) in the "Quantitative Methods in the Humanities" course they give to some 100 students in the winter session. When asked why they decided to give the course in this type of environment, they replied as follows:

> *A lack of motivation and deficiencies in work methods and study strategies seemed to explain, in part, the course's high failure rate. As much of the literature says PBL has the potential to stimulate motivation, cognitive involvement, participation, and the development of learning strategies in students, we decided to try out this method, using two groups of students having problems in the 2008 winter session. While this year of experimentation allowed us to adapt the PBL approach to the day-to-day realities of the college, the traditional environment of classrooms and computer labs was unsuitable. We felt it was vital that students be able to work in teams and use IT at all times; we also wanted team supervision and coaching to be easier, and to be able to teach the entire group by means of theory capsules, if need be. In the fall 2010 session, the college therefore provided a technical environment that was better suited to teachers' needs.*

In the winter of 2011, the effects of the multipurpose classroom used in the "Quantitative Methods in the Humanities" were formally assessed, with instructors completing a weekly form to ensure activity follow-up. The instructors and ITREP were thus able to evaluate their students' attitude and behaviour (involvement and participation, contribution to teamwork, concentration, punctuality, attendance, etc.) by means of ratings (excellent, acceptable, unacceptable, problematic, and N/A). By using these same ratings, the instructors also assessed the technical aspects of the classroom (operation and hookup of students' computers and the instructor's touch-screen computer, network access, software and video-projector performance, etc.). They were also asked to note their favourite moments and irritants of the week. Students took part in the evaluation via a survey, and the assessment findings made it possible to make adjustments (visibility, work space, effectiveness of tools, etc.).

Both instructors were very enthusiastic about using PBL in the multipurpose classroom, noting a marked improvement in student motivation, active participation (information searches, online exercises, discussions on the comprehension of problem scenarios, discussions among teams, presenting work on the giant screens, etc.), the quality of learning and skills transfer (mainly in the introductory course on methodological principles for the humanities). The absentee rate fell and the failure rate dropped by 20%, from 35% in 2007 to 15% in 2011.

Ms. Beaulieu also uses PBL and the multipurpose classroom in the statistics course she gives students from other programs.

The multipurpose classroom can meet the most traditional needs: a biology instructor uses it with groups in the natural-sciences program, and another with a group in the tourism program. The room is also used on an ad hoc basis.

Source: Bernard Gagnon, educational advisor and ITREP [bgagnon@cstfelicien.qc.ca]

[1] These instructors and the college's ITREP have published a detailed account of the experiment they have been conducting since 2008 on Profweb, with examples of scenarios used in class [http://www.profweb.qc.ca/index.php?id=3772&L=0&cHash=d00cc0968b8832fdea9fa0364fa5161c].