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Innovating Education for Sustainable Urban Development through Problem Based Learning in Latin America: Lessons from the CITYLAB Experience

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ABSTRACT

This article discusses the challenges and opportunities identified in the implementation of the Citylab project in Latin America during the period of 2015-2018. The project was funded by the Erasmus+ Key action 2 programme of the European Union. The project aims to innovate teaching for sustainability in higher education institutions through Problem Based Learning (PBL). Opposed to traditional teaching methods, the pedagogical approach of PBL is a learner-centred approach that takes a complex problem as point of departure instead of existing established knowledge. Since application of such learning methods is limited in Latin America, the Citylab project attempts to introduce PBL in the existing curricula of 12 Latin American universities through the implementation and development of interdisciplinary Citylab modules focusing on sustainable urban development.

First, the role of PBL in education for sustainability is discussed in a broader theoretical context. Second, the goals, implementation strategies and results of the

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Citylab project will be presented. Third, we highlight some critical issues and success factors experienced during the project. The findings of this paper are based on (1) self-reported questionnaires from the partners at the end of 2017; (2) on-site visits by the authors and expert visits; (3) focus groups, interviews and conversations with project leaders of the participating institutions during the project.

Depending on the institution, the project results were varying in terms of innovation and upscaling potential. Critical factors were related to the role of the project leader in the organization, the flexibility of the implementation and cultural differences. Internal regulations created both incentives and disincentives for participation. Competitive elements in the project and available resources for equipment can act as stimulators in some cases. The challenge lies moreover in detecting windows of opportunities for change in order to accomplish curriculum reform and by doing so, pursue continuation of the PBL approach after the project's horizon.

LEARNING FOR SUSTAINABILITY WITH PROBLEM BASED LEARNING

Article 2.3 of the Nagoya declaration on Higher Education for sustainable development of the United Nations Decade for Education on Sustainable Development recognises that higher education institutions play a crucial role:

> *"to develop students and all types of learners into critical and creative thinkers and professionals to acquire relevant competences and capabilities for future-oriented innovation in order to find solutions to complex, transdisciplinary and transboundary issues, and to foster understanding and practice of collective values and principles that guide attitudes and transformations, respecting the environmental limits of our planet, through education, training, research and outreach activities (HESD, 2014, art. 2.3)".*

In Latin America, initiatives have been taken to give sustainability a more prominent place in the learning outcomes of higher education institutions (Sáenz, 2015). However, there is a growing awareness that also teaching methods matter. The type of competences and skills that are required in sustainability education stretches beyond what traditional education usually delivers. Sahlberg and Oldroyd argue that the bureaucratic industrial oriented and standard driven approach to education is inadequate to face the challenges that lie ahead and that drastic reform is needed (Sahlberg and Oldroyd, 2010). Thomas argues that teaching approaches related to sustainability must focus on elements relating

to the process of learning, rather than the accumulation of knowledge (Thomas, 2009). Some scholars advocated that curricula in sustainable development need to be interdisciplinary and cross-cultural (Li et al., 2018), oriented at deep learning rather than rote memorisation (Warburton, 2003) and stimulate system thinking, anticipatory and critical thinking (Rieckmann, 2012). Others have argued that active collaboration with various stakeholders throughout society—transdisciplinarity—must form another critical component of sustainability efforts (Trencher, Bai, Evans, McCormick, & Yarime, 2014; Yarime et al., 2012).

Problem based learning (PBL) is considered a viable teaching method for sustainability education (Li et al., 2018; Thomas, 2009), that meets many of the criteria of proper sustainability education. PBL is an inquiry-driven learning method in which learners engage in a self-directed learning process based upon a real life problem (Kwan, 2009). PBL is typically learner-centred (Hmelo-Silver, 2004). This means that the learners assume active control over their own learning process while teachers take the role of coaches rather than instructors (Kolmos et Al. 2008). Successful PBL learning experiences start from ill-structured problems which have no straightforward right solution and allow free inquiry. Typically, students work cooperatively in small groups (Bate et Al. 2014). The approach is oriented to developing high level skills as depicted in the top of Bloom's revised taxonomy (Anderson e.a., 2001). As learners have control over their learning process, it is stated that PBL stimulates intrinsic motivation and critical thinking (Zabit, 2010). Moreover, PBL changes the nature of how knowledge is transferred and created. In traditional education, students learn general models and theories which they can apply to solve future problems. Conversely, in PBL the process starts with problems which the students face and motivates them to search for knowledge to solve them. PBL knowledge is developed during the inquiry and thus context specific. However, rather than focussing on the substantive aspects of knowledge, learners become trained in developing skills to address new and unknown complex problems. Table 1 summarises some of the important differences between "traditional" courses and "PBL" courses

	From: Traditional courses	**To: PBL courses**
Orientation	*Teacher centered*	*Learner centered*
Teaching forms	*Ex-cathedra teaching*	*Supervising, coaching and consulting*
Content	*Theory-based, Knowledge is given*	*Problem or project based, knowledge is constructed on the basis of complex problems or projects*
Scope	*Monodisciplinary*	*Multi- and Interdisciplinary*
Learning process	*Individual, Passive*	*Group work, Active*
Evaluation	*Dominantly summative evaluation, oral or written exams*	*Formative & summative , jury's, peer evaluation, self evaluation*

Table 1: Differences between traditional courses and PBL courses

PBL is not a uniform approach and in reality different varieties exist. Barrows differentiates six different types of PBL which vary in two underlying dimensions: the level of structuring of the problem and the degree of self-directedness (Barrows, 1986). Project based and case based learning are methods that are related to problem based learning. In project based learning, learners are provided with a general challenge or overall objective and the learning process involves the design and development of possible solutions. Case based learning helps learners to understand important elements of a more structured problem, and to develop critical thinking skills in assessing the information provided, identifying logic flaws or false assumptions (Walker, Leary, Hmelo-Silver, & Ertmer, 2015).

IMPLEMENTING PROBLEM BASED LEARNING IN LATIN AMERICA

Motivated by its pedagogic potential for sustainability education, the Citylab project aims to innovate teaching by introducing Problem based learning, in particular related to urban sustainability in Latin America. It also aims to foster interdisciplinary cooperation in education on urban sustainability. Finally, the Citylab project aims to contribute to set up partnerships between universities and external actors, in particular local governments.

The project has been developed within the framework of Erasmus+ key action 2 by a consortium of 17 partners. In total, 5 European and 12 Latin American universities participated. The actions under this program make it possible for organisations from different participating countries to work together, to develop, share and transfer best practices and innovative approaches in the fields of education, training and youth. The project was initiated by the University of Antwerp in cooperation with Columbus Association which received funding early 2016 and ran until October 2018. The University of Antwerp coordinated the project.

Implementing learner-centred innovations, in particular in the context of international cooperation, poses specific challenges and problems. Schweisfurth (2011) identifies different barriers in implementing such approaches in low and middle-income countries such as unrealistic expectations on the side of the program sponsors and education institutions, the lack of proper resources for staff and material, cultural differences that inhibit coaching teachers roles, and the lack of power of the implementers to change the institutional status quo. Especially cultural problems were encountered in educational reforms in multiple countries in Africa (Vavrus, 2009), leading to the metaphorical description of “tissue rejection” of learner centred approaches (Harley, Barasa, Bertram, Mattson, & Pillay, 2000). Also the upscaling and sustainability of the project can be a particular challenge (Constas & Sternberg, 2013).

In the CITYLAB project, implementation issues and possible "tissue rejection" had been considered in the conceptualization of the project. To avoid these, four principles were used to guide the development of the implementation strategy: (1) implementation flexibility (2) contextualisation, (3) upscaling strategies and (4) incentivising teachers and institutions. An overview of the project and its different components is given in figure 1.

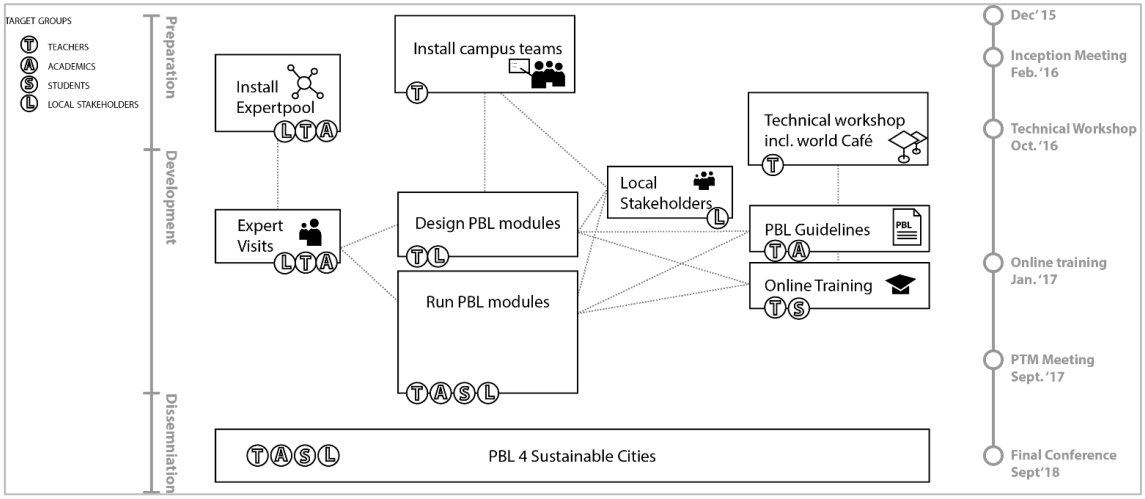

Figure 1: Implementation process CITYLAB LA

Implementation Flexibility

With 12 partner universities in Latin America, project implementation had to be sensitive to national and local constraints and opportunities. Rather than seeking a uniform approach for all the partners, we allowed a flexible implementation of PBL in the educational curricula, in so called "PBL modules". We hereby aimed to avoid extensive top-down curriculum reform which generally takes years to complete and can meet serious resistance. Participating universities were autonomous in deciding which modalities of PBL to implement, ranging from light to more full versions of PBL. The design and implementation of the modules at the university level was done by local "campus teams", with campus team leaders formally responsible for local implementation. Campus teams were in charge of designing "PBL modules" that could take various forms. However, they had to meet basic criteria reflecting a PBL approach:

1. The module had to be accredited and part of a regular curriculum
2. The module had to reflect basic PBL principles. Students learn collaboratively and teachers act as supervisors.
3. The module addresses an urban problem and is oriented to a contribution to solving one or more sustainable development goals (SDG's), as defined by the 2030 sustainable development goals adopted by the United Nations Member states on 25 September 2015

4. The module had to run in close cooperation with partners from local city governments and organizations
5. The module had to be interdisciplinary: staff and students from at least 2 different faculties within the university had to be involved

The PBL-modules could be a transformation of an existing course, or a new one. They could be compulsory, elective courses or summer schools. PBL implementation could vary from single courses to whole programs in principle.

Contextualising

In order to address cultural differences in teaching, we followed the advice of Varvus, Chisholm and Leyendecker to adopt a constructivist approach to education in local contexts (Chisholm & Leyendecker, 2008; Vavrus, 2009). The PBL-reform has been set up as a mutual learning process between countries in Europe and countries in Latin America, allowing the development of a culturally embedded form of PBL, rather than an approach that aims to export European educational practice to other contexts. The mutual learning process started with the development of PBL guidelines at a three day workshop with teachers from the different campus teams in the format of a world café (Brown & Isaacs, 2005). The discussion centred around fundamental issues in implementing PBL: curriculum design, the role of teachers and students, evaluation of students and working with external actors. The format of the world café stimulated appropriation and customisation of the PBL approach (see also Camacho, Rybels and Coppens in this issue). It was also intended to provide concrete guidance to the design and development of CITYLAB modules. The results of the discussion have been integrated in PBL guidelines. This is a set of recommendations on the design and implementation of PBL courses in Latin America which was supported by the core group of participating teachers in the program. As part of the process, an online training program was developed for teachers, in which the basics of PBL were explained. The online training program also included reference material and access to blogs in which the campus teams could post provisional results of their PBL module. Teachers involved in the campus teams were invited to subscribe in the online training program.

Upscaling Innovation

The project's implementation had been inspired by insights of niche management (Schot & Geels, 2008). The central idea of niche management is to create protected spaces which allow the development of new innovative practices in which a reconfiguration of actors and their techniques can occur. Strategic niche management recognizes the institutional inertia which innovations typically have to struggle with, but assumes that under the right window of opportunities, innovative niches can upscale to system wide innovations. Innovations in teaching are often frustrated by persistent university institutional structures

that regulate accreditation, evaluation and promotion of staff and resource allocation. However, niche management assumes that a combination of pressures in the wider socio-technological landscape and local innovation can lead to system innovations.

The Citylab modules are considered as innovative niches. Most of the campus team leaders have been recruited in faculties which contained programs in urban planning or architecture. The project proposal assumed that these programs would be most suited to start or to expand educational innovation within universities. Programs in architecture and urban planning typically have a tradition in more learner-centred approaches in the form of the design studio or the architectural studio. Studio-based learning has some features in common with problem based learning, although substantial differences exist (De Graaff & Cowdroy, 1997). Studio-based teaching at architectural schools generally have little explicit pedagogic concepts as they are rather based on tradition than an explicit educational strategy. Also, architectural design studio's tend to be loosely coupled if at all from more theoretical courses in their curriculum. Nevertheless, teachers within architectural studios are generally familiar with students working in groups on complex problems and these faculties have the necessary infrastructure to organise more learner-centred learning methods.

Citylab modules required the involvement of at least 2 faculties so that teachers were motivated to recruit fellow teachers from other disciplines, not familiar with studio-based teaching or problem based learning. The project assumed that the personal networks of the campus team leaders within the university would be sufficient to attract a group of motivated teachers to participate in the project and to continue participation after the lifetime of the project.

Incentivising

As participation in the campus team was voluntary, the project had to provide adequate incentives for teachers, students and university administration. In order to create some motivation, the Citylab project was set up as an international competition between students participating in the modules and working on the sustainable development goals in cities. Each of the participating institutions could select one team of students for the competition, based upon the output they produced in the modules. The criteria for the student competition had been set by the campus teams and include:

- The learning process and PBL experience
- The interdisciplinary of the work
- The collaboration with external actors
- The contribution to the sustainable development goals.

The student teams were invited to present a poster at the project's final conference in Bogotá. The jury was composed by members of the United Cities and Local Governments, UN Habitat, experts in Problem Based learning and representatives of university associations in Latin America. It was expected that the competition would contribute to the sustainability of the reform. If the competition within the network would have a recurrent character, there would be a lasting incentive to create PBL modules at universities.

A second incentive was given through a budget for equipment. Each campus team could decide to spend a budget to invest in equipment for running their module. A final incentive was given by the expert visits. Campus teams could decide to invite up to two scholars from other participating institutions to visit their Citylab module. It was assumed that the visit of academics from other institutions would give an incentive to meet the project criteria. The experts were also involved in evaluating the visited module during their site visit.

METHOD AND RESULTS

Method

The project implementation and results have been monitored throughout the project, both through internal and external evaluation methods. For internal evaluation and monitoring, the consortium organised regular online meetings, four face-to-face project team meetings and two workshops (see figure 1). During the project team meetings, the participating institutions presented their Citylab module as poster presentation in an agreed uniform format. This allowed the project management team to compare easily between modules and to keep a track of the implementation of the project.

The project also hired Columbus association to evaluate and monitor the implementation and impact of the project. External evaluation activities included surveys and focus groups among students, teachers, local actors and campus team leaders in different stages of the project. An overview of the collected data is given in figure 2.

TARGET	NO. OF SURVEY RESPONSES	FOCUS GROUPS	MAIN DIMENSIONS
STUDENTS	197	20	• Learning experience • Skills development • Interaction with local actors • Improvement possibilities
TEACHERS	87	20	• PBL • Skills and motivation • Collaboration with external actors • Interdisciplinary • Benefits and improvement possibilities
LOCAL ACTORS	29	N/A	• Satisfaction • Collaboration with Universities • Students performance • Improvement opportunities
CAMPUS LEADERS	13	17 (EU+LA)	• Institutional results • Collaboration with external actors • Interdisciplinary • Benefits and improvement possibilities

Figure 2: Overview of data collected in external evaluation activities

The survey was held during the last months of the project with an online questionnaire sent to students and teachers. From the 1482 students that participated in one of the modules, 193 students responded, whereas from the 192 academics that have been involved, 75 teachers responded, resulting in a response rate of respectively 13% and 39%. In addition to the survey, we organised focus groups with students and teachers during the mid-term technical workshops in Lima and Buenos Aires and at the final conference of the project. We also organised focus groups with campus team leaders.

Outcome of the project

During 2016 and 2018, 33 Citylab modules have been created. Although the project was targeted to teaching innovation in Latin America, four European universities also decided to create their own module and to participate in the project. In total the project reached a total of more than 1482 students and 192 teachers on both continents.

Most of the modules that have been created are modifications of existing courses in curricula. Some universities have also created new courses or multidisciplinary workshops. By adjusting existing courses, lengthy curriculum reforms and accreditation processes were avoided. Most modules were set up as elective courses at the undergraduate level. As 10 of the 12 campus team leaders in Latin America are related to architecture or urban planning, this is also the organizing faculty of 10 of the 12 modules. One module was organised by the mechanical engineering department (University of Pereira) and one by the faculty of economics and finance (University del Pacífico). The modules explicitly addressed one or more sustainable development goals, in particular SDG 11 regarding inclusive, safe, resilient and sustainable cities.

There were strong variations between the interdisciplinary setup of the modules. All of the modules had a multidisciplinary team of teachers involved, but in some cases the different disciplines involved were strongly related such as landscape architecture, urban planning and architecture (in Universidad Federal de Rio de Janeiro for instance). In other cases a more novel combination existed between teachers from more distant related faculties (Rosario, Pereira, Nuevo Leon, Guanajuato). In the University of Rosario for instance, the faculties of Science, Law, Journalism and Public Opinion, Urban Management and Sociology have been involved in the module. Most modules were open to students from other programs in other faculties as well, although some modules only targeted students of the curriculum of their own faculty.

All institutions involved external actors in their modules, with a dominant participation of public authorities and municipal governments. In Brazil, Venezuela and Colombia also private foundations or residential associations have been involved in the modules. The involvement ranged from light forms of interaction such as field trips or lectures given by external actors to more committed forms in which external actors have been active in the development and the implementation of the module. In some modules the external actors played a role in the evaluation of students and/or participated also as supervisors.

To support the modules, the Citylab project developed an online learning training for participating teachers, based upon the jointly developed PBL-guidelines. The aim of the online training was to develop a general understanding among participating teachers of Problem based learning, PBL course and curriculum design, PBL teaching methods and evaluation. The online training was run on a Blackboard platform and comprised different components: (1) an online PBL training with instructional videos and texts, (2) a blog in which the different participating modules posted their activities and progress, (3) a section with a discussion board to discuss particular issues within PBL and (4) a section with online resources on PBL. Although the online learning was initially targeted to teachers, some institutions also subscribed their students in the online course. It was felt that a better understanding of PBL principles among students would increase the success of changing from traditional learning methods to learner-centred methods. In total, 450 teachers and students participated in the online training.

During the implementation of the modules, the Latin-American universities could invite experts to support the development of the Citylab modules and to build PBL capacities. These expert visits were demand-driven, meaning that the receiving institution could identify a suited expert from the expert database which was developed at the beginning of the project. In total 14 experts from 5 institutions visited 11 different universities in Latin America.

The project ended in a three day conference in which participating teachers and students presented the results of their modules. Teachers and students in the participating institutions were also invited to reflect on learning for sustainability in academic papers. The scientific committee received about 31 papers representing 81 authors. The teachers involved in the modules documented their module and discussed it during a "world kashba", a modified version of the world Café format. The selected student teams of each institution presented the output of their work and their experience in a poster exhibition.

Impact of the Project

In general, the satisfaction of working with interdisciplinary PBL modules was very high. The impact of the project was measured on the different target groups of the project: teachers, students and local actors.

From the survey results among the teachers (N=75), we found that teachers believe that the didactic methods of their Citylab modules significantly contributed to the stimulation of critical thinking and complex problem solving of students, to create active learning environments and to work with interdisciplinary teams. Among less developed skills they identified: project management abilities, assessing the learning outcomes and negotiation skills for working with external actors. 99% of the surveyed teachers (N=75) feel more motivated to implement PBL in their courses after the project.

According to the student survey (N=193), PBL modules contributed most to improving skills in collaboration and team work, critical thinking and information retrieval and analysis. Less developed skills include: communication, project management and interpersonal relations.

The external actors (N=29) expressed a high satisfaction in working with universities during the project: 76% considered the collaboration very successful and 24% successful.

Continuation and Sustainability

The sustainability of the innovation was also ensured by the end of the project. 90% of the surveyed teachers stated that the continuity of the PBL modules was ensured or very likely to continue after the project lifetime. For 13% of the teachers continuation was only moderately likely. Less successful was the upscaling of the project: 53% of the teachers stated that the possibility to extend the project to other academic areas is only moderately likely.

It is important to note that the data collected in the project has some limitations. First, the data does not allow us to compare the impact of PBL based education compared to

traditional methods, as there is no data available for control groups. Therefore, on the basis of the gathered data, we are not able to conclude if PBL methods outperform more traditional methods in learning for sustainability. Such a comparison lies however out of the scope of the project and was taken as an assumption based upon earlier discussions in the literature on sustainability education.

Secondly, the collected data could be subject to a reporting bias in the sense that respondents overstate the outcome and impact of the project. The teachers involved in the surveys do have a stake in reporting more positive outcomes as the project is evaluated and financed on the basis of its performance. On the other hand, the corroboration of similar findings among students and local actors on the performance of the project in the focus groups and expert visits do support the positive results.

DISCUSSION: CRITICAL SUCCESS FACTORS AND BARRIERS

Despite the overall success of the project, the development and implementation of Citylab modules demonstrates a substantial variance among the participating institutions. Some Citylab modules are only small transformations of existing courses which already exhibit learner centred approaches. In these institutions, the innovation and upscaling potential of the Citylab project remains limited. In other universities, results have been more substantial and in some cases PBL was implemented in a broad curriculum reform of multiple faculties. This raises the question on which critical factors affected the implementation of the project.

A first factor was related to the composition of the campus team and the selection of the project team leader. The project team leaders' position within the university clearly affected how the project was implemented. In some institutions, the project team leader was part of the university board and had more leverage on curriculum reforms (University of Lima, University Belgrano). In other cases project team leaders were part of the university administration (University of Cordoba), which could implement more easily curriculum changes that affected multiple departments. In the institutions in which the project team leader was more peripheral in the department or faculty, the transformation of the curriculum and learning methods was generally more limited (UFRJ, Santa Catarina). Support from university policy makers therefore strongly affects the outcome, certainly when these policy makers have knowledge of and experience with Problem based learning (fi Pacifico). Positions within universities and faculties are however volatile and changed during the project, affecting the impact of the implementation.

Next to position, also motivation of the campus team members mattered. The transformation of courses in Citylab modules required a substantial effort and time investment from the participating teachers, often without remuneration from the project's budget. In some cases the motivation therefore depended purely on personal commitment to deliver better education. The competitive element of the Citylab project and the opportunity of operating in a transnational community also created a strong incentive for both teachers and students to participate in the project. Even the Venezuelan partners, which faced a deep national crisis during the timespan of the project continued their engagement to the project. An unexpected outcome of the competition was the development of Citylab modules at 4 of the 5 European universities in Europe. The project did not foresee any financial resources for this. However, students and teachers participated on a voluntary base. From the focus groups with teachers we learnt that campus teams usually were built on existing networks of teachers, sharing a common interest and mind-set. This proved beneficial for the implementation and development of the modules, but also impacted the potential reach and upscaling of the project within the university. By involving only existing and established networks of teachers from other departments, the project probably missed opportunities for new networks that might result in more innovative interdisciplinary modules.

A third critical factor affecting the implementation was related to the flexibility of implementation. The flexible approach of the project allowed for a diversity of effective implementation strategies, and a variety of degrees in PBL implementation. In some cases the road of minimal effort was followed in order to meet the Citylab criteria. Some partners opted for very moderate transformations such as a slightly adapted form of an architectural studio. Other modules opted for a more structured and university wide approach. More structural transformations occurred in those institutions with ongoing curriculum reforms and a strong commitment from the chancellor's office to learner centred approaches (U Rosario and U Pereira). Innovation upscaling required thus the right window of opportunity, which depended on the opportunity of ongoing reforms and a will of university policy makers to implement PBL.

Internal university regulations proved to be a fourth critical factor as they created incentives and disincentives of participation in the campus teams. In some universities, attracting teachers from other faculties proved to be daunting as teaching allocation regulations could not cope with interdisciplinary modules in which teachers of more than one faculty are involved. Moreover, teaching allocation rules generally do not take into account the labour intensive character of learner centred approaches, especially at the undergraduate level where mass education is still the general rule. Also involving students from other faculties was problematic as the scheduling of courses needed to be coordinated by the university administration. Internal reimbursement procedures acted as

strong demotivators for participation in the project. For instance, due to specific internal financial regulations some of the teachers had to pre-finance some of the international meetings with private resources.

Fifth, in the focus groups among teachers, it became clear that the international mobility through expert visits had a significant impact on implementation. Some campus teams reported that the visit of an external expert strengthened their position to convince the university administration in supporting the PBL approach in the Citylab modules. Not all universities made use of the possibility to invite experts. An important barrier was the specific funding rules of the Erasmus project, which did not fully cover the costs associated with the expert visits for the sending institutions.

Finally, few teachers reported cultural differences and some form of "tissue rejection", moreover in the expectations of students. In Mexico for instance, peer assessment was used to evaluate the module, which met criticism from the students. Also in some modules, teachers and students were having difficulties to leave their traditional roles and to engage into more coaching forms of teaching. In the focus groups with students, attention was raised to involve students in an earlier phase of the design and implementation of the modules. The project probably missed opportunities in preparing students to engage in new teaching methods. According to some students, the online course helped them better to understand Problem Based Learning and the mutual expectations in the Citylab Modules. The online course was originally not intended for students and only in a few institutions students have been enrolled on a voluntary base in the training.

CONCLUSION: LEARNING FROM CITYLAB

Although it is increasingly recognised that the urban professionals of tomorrow will need new range of skills in dealing with the challenges of sustainable urban development, there is still a large inertia in educational methods in higher education in South America. Projects aimed at educational innovations, in particular in international settings, have often failed to deliver a sustainable impact on education.

The results from internal and external evaluation data of the Citylab project seem to demonstrate that a set of well-designed implementation strategies can overcome reform barriers. Based on the theory of niche management, the project developed an implementation strategy by selecting niches of innovation at universities and devised a set of incentives to upscale innovative practices throughout the university. These niches have been expanded by involving students and teachers from more traditional faculties.

The fact that 99% of the teachers that have been involved in a Citylab module reported that they will continue using PBL in their courses gives some evidence that the project lead to a sustainable implementation.

PBL is not a strictly defined concept or procedure, but leaves room for interpretation. This was beneficial to the implementation of the project as it leaved room for flexibility in the implementation and appropriation to the local context of the higher education institution. The flexibility of implementation allowed to make better use of local opportunities and resulted in a diversity of implementation modalities. Appropriation was achieved by involving the participating teachers in the development of PBL guidelines and an online training. The evaluation data showed only limited instances of "tissue rejection" of PBL, despite the cultural differences in teaching and education in the different participating countries. However, the project would have benefited from more involvement of the students in the design and implementation of the Citylab module.

Introducing a competitive element in the international network of higher education institutes created incentives and motivation for students and teachers to adopt new teaching methods and to collaborate with colleagues in other faculties and external actors. Internal regulations and intrinsic motivation proved to be equally important.

The upscaling of the project is less certain and depends mainly on local "window of opportunities" for reform that are supported by local university policy makers. Upscaling is more likely when there is a strong and simultaneous involvement and engagement from the university administration, faculty members and university policy makers to reform educational methods.

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