
Mediating research and practice: The dilemmas of designing didactic sequences by integrating teacher knowledge and research on teaching

Entre recherche et pratiques : concevoir des séquences didactiques en intégrant les savoirs des enseignants et ceux de la recherche

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Mediating research and practice: The dilemmas of designing didactic sequences by integrating teacher knowledge and research on teaching

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Dans cet article, nous discutons les possibles rapports dynamiques entre recherche, politique et pratiques, à partir du ré-examen d'une expérience d'un an de développement de matériels didactiques avec des enseignants d'écoles multi-niveaux situées en milieu rural. Nous cherchons à montrer et comprendre la dialectique entre, d'une part, notre savoir, construit dans le domaine de la recherche académique sur l'enseignement et l'apprentissage et, d'autre part, le savoir acquis par les enseignants à travers leur formation et leur expérience. Notre point de vue rejoint celui des chercheurs plaçant pour une collaboration étroite entre équipes de recherche et enseignants en exercice, comme moyen de dépasser les résistances aux réformes pédagogiques introduites par des experts extérieurs ou par les autorités hiérarchiques.

Mots-clés (TESE) : didactique, réforme de l'enseignement, recherche, classe hétérogène, savoir

Introduction

The dynamics of *mediation* between research, policy and practice has proved to be an extremely complex process, largely ignored in mainstream educational discourse. One facet arises between specialist or

"expert" knowledge constructed in the context of research laboratories and the specific knowledge teachers gain and construct through years of training and classroom practice. In this article we approach this aspect through a reflection on a year-long experience in conducting a workshop with teachers for the

purpose of producing didactic strategies for math and language instruction in multigrade schools. Our documentation of the experience offers ample insight into the tensions and outcomes of a dialogue between academic research on teaching and learning and the knowledge that teachers use in everyday practice. In framing our perspective, we drew on scholars who have called for closer collaboration between research teams and in-service teachers as a way to overcome perceived teacher resistance to educational policies and reforms imposed by authorities or proposed by external experts.

Our experience is framed in a context marked by this dilemma, as the federal government in Mexico, following international trends, had launched an educational reform (2013-2018) reinforcing centralized control, instating high-stakes teacher assessment, and imposing a highly-scripted and regulated universal curriculum. The continual modifications of the national competency-based curriculum since 2009 as well as the recent teacher assessment and recertification process have led education authorities to fund a series of required short-term courses, generally outsourced and wrapped in the discourse of efficiency and quality. For example, teachers had to take a course on producing the “evidence” they were required to submit online as part of the evaluation of their practice. Most courses provoke, as Gather Thurler (2000) notes, rejection and defensive strategies among teachers. The trend has led to the teachers’ belief that it is useless to seek training with distant “experts” who are unaware of their specific problems and needs; paradoxically, it has also cultivated a simulated acceptance among teachers that only “the experts” are knowledgeable.

Our project took place before the new curriculum was launched, and was situated in a rather marginal niche, as local educational authorities in one state had obtained minimal federal funding to foster the aims of “equity and inclusion” in multigrade schools located in rural communities. Our task was to design and conduct a 60-hour workshop with 200 multigrade K-9 teachers in order to develop better didactic strategies for math and language instruction. We¹ interviewed around

24 candidates proposed by the local team in charge of the project and incorporated 11 of them as *facilitators* (a term recently used in official documents). They had different educational and professional trajectories and worked in the different levels and modalities of the school system². Most had previous experience in leading courses or workshops for teachers. Although they had not designed didactic materials before, their knowledge of the rural communities and of the everyday functioning of the school system were most valuable. We worked closely with them to design the workshop, yet they were directly in charge of sessions with the teachers. When we decided to produce the manual (Rockwell, Rebolledo Angulo, Mendoza von der Borch et al. 2017), they also contributed to the final elaboration and design of the strategies that had been agreed upon in each group.

The experience posed theoretical as well as practical challenges. While recent international mandates have promoted the importation of foreign “evidence-based best practices”, many comparativists signal the need to attend to contextual diversity and to develop viable practices based on research conducted with local educators (Steiner-Khamsi 2000). The first approach stresses a hierarchical opposition between expert knowledge and practical experience and has often generated further resistance to educational innovation. In Mexico, the situation has been aggravated by the political urgency of a top-down implementation of radical reforms through a centralized and hierarchical institutional structure (Ezpeleta 2004, 416), intent on generating laws, regulations and directives in order to prescribe and control classroom practices. The apparent failure of a recent reform (2006-2011) headed by delegates of the official teacher union led to the opposite pole, a fast-track enactment of educational laws (2013) and adoption of policies designed by experts, largely following international models, with complete exclusion of the teacher corps.

Meanwhile, the slow process of educational research in Mexico has been caught in the middle terrain, although it has produced valuable knowledge

1 We always refers to the research team, which included Rockwell, a senior researcher specialized in the history and anthropology of school cultures and teacher practices; Rebolledo Angulo, an anthropologist with a doctorate in Educational Research, who had conducted an ethnographic study on language teaching in a bilingual one-room primary school; Tapia Álvarez, an elementary school teacher and teacher-trainer specialized in language instruc-

tion and Mendoza von der Borch, with long experience in teacher training and textbook production in mathematics. Moisés García, specialized in mathematics instruction, was also part of the team. The project was financed by the Ministry of Education of Tlaxcala (USET) and the Cinvestav.

2 These included regular preschools, 6-year primary school and 3-year rural secondary schools, plus a few indigenous bilingual and special education schools, all with multigrade groups.

both of didactic sequences that favor significant learning and an understanding of the constraints and possibilities of actual classroom situations and local school cultures. In this context, work with rural multigrade schools, marked by greater diversity and difficult teaching conditions, offered us a test-case for the integration of our research knowledge with the teachers' experience in the development of viable teaching strategies. The present analysis allows us to retrace our steps and examine the interface between teaching and research cultures, understood not as closed systems but rather as interlacing networks of knowledge, perspective and argumentation. The experience led, in this case, to tentative though valuable outcomes.

Theoretical challenges

The discrepancy or incongruity between the perspectives of researchers and those of classroom teachers has been well documented. Over a century ago, John Dewey (1902) addressed the issue of apparent rejection of novel pedagogical proposals designed to "follow the nature of the child" by analyzing closely the "educational situation" that placed constraints upon what teachers were actually able to do within the existing spaces and times of schooling, given the impinging administrative and bureaucratic structures and the normative content of the curriculum. Subsequent research on teaching and change has substantiated this view, as teachers resist pedagogical and curricular norms handed down through governing bodies (Tyack & Cuban 1995; Fullan 2016; Gather Thurler 2000; Viñao 2001; Westbury 2008) or fashion their own teaching cultures through selective hybridization of novel proposals and previous practice (Anderson-Levitt 2001).

As a result, teachers are held responsible for not following the official prescriptions and thus causing the "failure" of reforms. In contrast, Fullan (2016) has argued that the cause of the "spectacular lack of success" of social reforms is neglecting to understand that teachers experience changes differently from the way they were planned. Levinson and Sutton have pointed to the need to study "policy as/in practice" (Sutton & Levinson 2001; cf. Westbury 2008) in order to comprehend the successive *mediations* that take place between initial policy formulation and actual repercussions in classrooms. Others argue that the implementation of reforms is hampered by the intervention of multiple actors who operate in a relatively fragmented and contradictory manner (Viñao 2001; Fullan

2016). In fact, reformed curricula, laid out in lengthy specialized documents, tend to accumulate ever more contents to be taught in the same fixed time-frame (year, grade or level). Given the strong temporal constraints of schooling, teachers are forced to choose and adapt, as covering all that is mandated would be virtually impossible (Chartier 2007).

The specific logics of policy-makers, researchers and teachers are often at odds when converging on the classroom situation, giving the impression that school cultures are inherently conservative. Yet Viñao has also pointed out the "danger of giving an excessively stable and immutable impression of the education institutions [...] The very same school culture is something alive and changing, with its own internal dynamic... creating its own products [and] transforming and adapting them to its requirements and digesting successive education reforms" (2001, 43). Thus, rather than understanding "cultures of schooling" or "teacher cultures" as obstacles to change, we might heed scholars who seek to understand the ongoing assembly of the knowledge required for teaching through selective appropriations of traditions, resources and innovations, and their adaptation to particular sociopolitical and cultural contexts over long periods of time (Isambert-Jamati 1990; Chervel 1998; Rockwell 1999; Anderson-Levitt 2001).

By studying the complexity of the actual reforms, many scholars have moved away from notions such as "adoption" and "implementation" of educational innovation towards models of mutual collaboration and construction of proposals between classroom teachers and researchers. For example, Perrenoud's sixth "challenge" for training teachers is to "begin with, but not be bounded by, [teachers'] practices and experiences in order to compare, explain and theorize [them]..." (Perrenoud 2001, ch. 8). Perrin-Glorian (2009) has problematized the transmission to teachers of didactic situations designed through controlled research (Brousseau 1998); she suggests that design should include from the beginning «a much more dialectical adaptation in relation to ordinary [classroom] practice» (2009, 68)³. The problem becomes one of determining which elements of the proposed activity are fundamental for the students to actively construct

3 "...il s'agit de passer de l'idée de transmission qui pose le problème de façon descendante de la recherche vers l'enseignement à une idée d'adaptation beaucoup plus dialectique relativement aux pratiques ordinaires" (Perrin-Glorian 2009, 68).

concepts, and which can be modified by teachers as they appropriate and adapt the didactic proposals to their own classroom conditions and ways of teaching. She also insists on modifying the original proposals themselves when they prove to be unsuitable or unmanageable in ordinary classroom conditions or to require too heavy an investment of time and materials on the part of teachers.

In practice, we found that reframing the “interface of research with teaching” is easier to imagine than to achieve. Given the short time-span of our workshop—60 hours per group in four 12-hour sessions held every two weeks—we decided to begin with contents and activities that were familiar to the teachers and extend or enrich them to enable multigrade instruction. Each facilitator worked with a mixed group of teachers of different levels (K-7) who would propose, try out in practice and then share the results of possible activities to teach one of the 20 topics (e.g. words, instructions, multiples, area). Each group was to agree on an activity that could be “stretched out” by progressively increasing the difficulty in order to both include and challenge all students that come together in multigrade classes. For example, the activity of stringing colored beads following certain patterns, common in preschools, was extended first by having students draw and color series with single and double multiples and then by posing problems on multiples that required imagining and/or calculating series with larger numbers. The groups eventually produced twenty such “didactic strategies” which formed the core of the proposal.

The facilitators were the fundamental mediators. In biweekly meetings, they gave voice to the ideas and knowledge that teachers expressed during each workshop session. They also transmitted to the teachers the recommendations that we offered as specialists in didactics of language and math. They became two-way interpreters. They often made us realize the importance of understanding the meanings and nuances of the terms used by the teachers, and of adapting our own language to make ourselves understood. To a large extent, this became a crucial step in assuring that the mediation process could lead to the construction of viable and useful didactic strategies. Moreover, together with the teachers they contributed their experience, and put into practice the evolving strategies and brought photos and students’ work to document the process. We, as researchers, took turns to accompany some sessions directly, to be avail-

able for consultation or interact at certain moments with the groups.

Divergence and convergence of perspectives

In managing the project, we experienced moments of tension, but also eventual convergence in the mediating process undertaken to produce the didactic manual. The group of in-service teachers and facilitators participating in the workshop was quite diverse, and we, as researchers, also had different perspectives and experiences. In conducting the workshop, we endeavored to combine the different outlooks; tensions inevitably emerged but tentative solutions also came forth.

Initial sources of discrepancy

A central point of discrepancy between us as researchers and the teachers was related to the feasibility of activities in actual teaching conditions. Conditions such as access to material resources and the need to maintain pupil attention in the classroom strongly influenced their selection of activities. For example, during a discussion on teaching surface area, the math specialist suggested using geoboards to transform triangles, rhomboids and other shapes into rectangles with the same surface and calculate the relative areas by counting units. Teachers objected arguing that it was not feasible because good geoboards are not easy to build, and commercial ones were poorly made. A fundamental contribution made by teachers and facilitators was the selection and adaptation of the strategies to their institutional conditions: the use of time, space, resources, and the mandated curriculum. Proposals that were not generally feasible in classrooms, even though practiced by certain teachers—were discarded or replaced by simpler versions to accomplish the same goal; thus, rather than setting up a corner play-store so students could practice selling and buying, as one teacher had done, the group invented a board game representing a store.

Some tensions emerged among teachers in each group. A few stemmed, we think, from teachers’ recent access to a supply of attractive commercial gadgets for teaching. Some teachers proposed games and activities involving novel materials, arguing for their ludic qualities. For example, one group favored a game

called *Twister*, adapted to test knowledge of number series. Proposals such as these, centered on diversion, reflect curricular norms that stress the value of “play” and of using “didactic materials”, and yet have entered classrooms with little attention to their possible support of students’ conceptual development. They also reflect the enormous amount of materials available to teachers through the internet, training courses and commercial textbooks. Teachers have chosen these options, among other reasons, to better regulate and control the class and prevent children from getting bored or disruptive.

However, other teachers recovered traditional Mexican games, such as *Rayuela*, which involves tossing an object towards a target line drawn on the ground. It was adopted by the teachers as a strategy for comparing different ways of measuring the distance from the target line: handspans, stable units such as a drinking straw and finally, the metric units of measuring tapes. It would help students to progressively develop the notion of a standard unit, required very little preparation, and could easily be repeated by the students of different ages among themselves. However, it was difficult for the proponents to convince their peers of the relative advantages of these activities in face of more alluring games such as *Twister*, without the stronger arguments offered by the researcher who valued the new option and the additional potential it offered for estimating distances and comparing results with actual measurements.

Once an activity had been chosen by a group, other tensions arose among the teachers regarding details of the activity. The facilitators identified these tensions and transmitted them to the researchers. In the case of the game *Rayuela*, for example, the facilitator told one of us that there was a controversy over the smallest metric unit to be used to measure the distances: some teachers had used millimeters, others considered that it was too small and difficult to handle in the game. Both defended their positions claiming that they practiced the game with their own students, yet agreement favored the second option. After the workshop, the facilitator also commented that the game, originally proposed as a way to approach fractions, had turned into an activity in measuring length. She convinced us that the group’s topic, fractions, was indeed crucial for the teachers (in fact, it had been mentioned several times in choosing the topics). She therefore proposed adding a second strategy, by recovering an activity initially proposed by some teachers,

based on folding strips of paper to obtain strips of $\frac{1}{2}$, $\frac{1}{4}$, and so on of the original length. These strips and their fractions could then be used to measure lengths, without resorting to metric units, but rather assuring comparison of fractions.

Finally, divergence among specialists and teachers was evident when some teachers wished to link the task to the official curriculum. They understood the proposed activities as “filling in” certain moments of the day, but not as suitable for institutional lesson plans. In contrast, we were aiming to build core activities that could be repeated by students at different levels of schooling and that would progressively strengthen their reading and writing skills and basic math strategies. Although during the workshop teachers had agreed that the graded curriculum offered few opportunities to work with multigrade classes by following each child’s needs, when they returned to their schools due to official supervision they found it increasingly challenging to set aside the sequential graded curriculum that ignores the existence of schools with multigrade classes (48 % in México).

Building proposals through various contributions

Many of the tensions discussed above were resolved through various contributions. As teachers put into practice some of the activities being considered and shared the results with visual evidence put online or brought to the sessions, the teaching strategies were further developed in the groups.

For example, when dealing with the topic of writing instructions, some teachers wanted to have students follow recipes with actual cooking activities. We problematized the proposal asking how students might learn to both understand written instructions and to produce them, and how to enhance the activity to challenge the more advanced students. The teachers began to discuss what they hoped students would learn and concluded that the purpose should be to teach them to give instructions in writing. They decided that the students themselves should produce instructions with the steps to follow for an activity and then share them with classmates to see how they were followed. Thus, they could identify their errors when something went wrong and learn how to express each and all steps clearly, in order to be understood. Teachers were enthusiastic with this idea and proceeded to design the successive versions of the strategy and

place them in order of difficulty. Another issue in this group involved the special education teachers, who at first claimed that the whole topic was impossible for their students. The facilitator suggested using daily activities, such as washing your hands, for which they could write or draw instructions, and the teachers accepted it. The suggestions helped broaden the range of activities beyond recipes, to include such things as invented games or experiments.

In another group, in the first attempts to design a strategy for teaching surface area, several diverging ideas were presented. An activity proposed by some teachers (coloring figure ground worksheets) would not lead to the topic of areas and the geoboard suggested by the math specialist was not practical. As the search continued, another one of us suggested that something similar could be done with by tracing figures on squared paper and counting units. This activity had the didactic value of allowing students without previous knowledge of the formulas to approach area by counting the squares one by one, and leading them to devise better procedures (such as counting by rows, regrouping and adding) when tracing larger rectangles where counting was difficult. Furthermore, it required practically no material and was easily managed in the classroom. When tested with students, the results satisfied teachers. To construct the simpler versions, we recovered a proposal by another teacher and a facilitator to form or replicate different figures with the same quantity of like-sized squares of paper.

Many solutions to enrich an activity came from the facilitators. An example was with word cards, which in traditional practice tends to lead to classifying cards according to word families based on phonetic or lexical criteria. The facilitator working with this topic led the group in a different direction by proposing rather to allow children to build different possible groupings based on familiar spheres of everyday life, where words could be alternatively placed in different groups. For example, a particular meal could belong both in “the kitchen” or in “the feast”. This would also allow students to identify meanings closer to their own worlds and form groups of words related to proximal or distal domains or even to other languages.

Examples such as these show various types of knowledge in play. The knowledge teachers possess was balanced with our knowledge of math and language instruction and of the possible learning advantages of certain procedures and activities, as well as our ethnographic understanding of classroom tea-

ching practices in rural schools. These had different sources yet were each indispensable for the construction of a didactic proposal that might be both recognized as feasible by the teachers and significant in terms of possible learning outcomes.

By the end of the workshop, all groups had agreed on activities that had seemed to work in practice at least in some schools. Interestingly, there was much sharing across grade levels, which led to the development of activities used for the younger children into more challenging versions for older students or vice versa. Thus, a suggestion made by one group was adopted by all: instead of classifying the successive activities by grade or age level, they were simply identified as versions A, B, C and D, with the idea of leaving the choice of versions to use with a particular multigrade class up to each teacher.

The final process of writing up the strategies was undertaken by the research team and the facilitators. Although we had rough drafts from each group, there were many gaps and styles of presentation, and some proposals required further discussion and classroom trials. In some cases, we had to design some of the simpler or more complex versions of each activity, in order to complete the four-phase sequence of our proposal. Some facilitators continued elaborating the proposed strategy with students, offering verbal and visual evidence. Our direct observations and the testimonies and photographs of these experiences allowed us to gain a different viewpoint and rethink details, such as instructions that were hard for students to follow, or easier and more durable ways to make materials without reducing the value of the strategy. Thus, although the manual recovered the activities produced in the workshop, the final product was an elaborated and illustrated version of the original workshop materials.

Discussion: meeting the challenge of integrating knowledge

The indication of recovering teachers’ knowledge and integrating it into didactic strategies produced by experts is often voiced, nevertheless it proved to be a complicated task, requiring hours of discussion among teachers, facilitators, specialists, and eventually with graphic designers and editors.

Our team’s approach included two research traditions. Qualitative classroom research, in our view, attempts to comprehend the complexity of classroom

interaction within specific contexts in order to grasp not only what teachers actually do but also why they teach in certain ways. This allowed us to anticipate conditions affecting didactic proposals in practice, such as material and time constraints. Given our approach to learning math and language, we kept an eye on the connection of proposed activities with the concepts students were to learn. We took care of the ways in which activities might foster participation, reorienting some of them to allow students to approach problems and deploy diverse methods, use their own procedures, and verify their anticipations. Thus, the final versions of the activities were designed to both allow and compel students to advance on their own.

Teachers generally considered the dynamics of time and classroom management, kept an eye on what was feasible, and on the need to make activities more explicit and avoid unmanageable proposals. They offered insights into what available activities had actually taken root in school cultures, under what conditions, and which have had scarce echo in practice, although considered effective in experimental research on learning. Teachers and facilitators gave us tips and warnings and we in turn gave suggestions and sought materials and recommendations for the teachers. Thus, during the whole process of the workshop and final design, many different levels of mediation occurred among and between researchers, facilitators and teachers.

In order to integrate these diverse views, it was necessary to acknowledge that all contributed valuable knowledge, a stance that was not easy given the evaluative policy context that teachers faced at the time. Our task was not only to recover teacher proposals, but also to convince them to share, discuss, put into practice and then comment on what occurred with proposed activities. This experience shows that both training and the production of materials with in-service teachers depend on a relationship in which the teachers feel free to give an account of their own practices, rather than only offering the discourse they believe is expected of them given the normative context. Constructing this sort of trust requires an open and respectful attitude and ability to admit that some research-based proposals are not feasible under actual teaching conditions. Everyone involved had to learn to accept that their ideas were tentative and could be discarded or modified in the process.

The prolonged interaction among participants was invaluable. The design of a workshop that allowed tea-

chers to take up proposals and test them with their own students, in order to bring evidence and reflections back to the discussion, helped modify and enrich the proposals. Some technologies, such as cellphone photos, videos and social networks, enhanced the sharing process among participants, though not all had access or time to use them. Finally, only ample time for personal face-to-face co-construction makes this sort of mediation possible.

Conclusion

In reviewing this experience, we have attempted to show that *mediation* among researchers, facilitators and teachers is not only necessary but vital to the outcome of proposed policy changes. We consider that it is no longer fruitful to draft proposals at a distance from teachers' everyday life and working conditions. In spite of their strong theoretical grounding, such innovations are often not feasible in actual classrooms. Nor is it possible to transfer to teachers the task of designing all activities when their training has not provided them with sufficient access to results of didactic research on the teaching of specific contents. Thus, participation of all sides is essential and their separate yet overlapping realms of expertise are reconcilable.

Our workshop proposed a form of in-service professional development in which teachers are regarded as active participants whose experience is considered valuable and has to be taken into account. In the process we generated analysis of the learning value of the activities they proposed and invited further development to meet the diversity of trajectories in a multigrade class. Critique and alternative solutions were forthcoming, particularly after testing and commenting on results.

During the workshop there were moments of tension and resistance. The reform context in which the workshop took place had placed teachers under pressure to comply with the official scripted curricula. The workshop was one more required course among many. It was difficult for them to break with the custom of applying novel strategies with little reflection on their educational value, as well as with the pressing need to solve contextual demands. Both federal and state authorities have since taken on other priorities, no longer attending multigrade teachers as such. This institutional situation and the graded curriculum influence the decisions that guide teachers' everyday actions. What little subsequent information we have points to

valuable individual appropriations of some of the proposed strategies, as well as to a lack of further interest among other teachers who took the course. Although we clearly recognize that there is still much to be learned, we wager that we chose the best path to produce teaching materials and alternative strategies for both teachers and children.

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