

Intercultural education and indigenous education in Mexico, an experience in Oaxaca

Natalia de Bengoechea

Universidad Pedagógica Nacional

bengoech@ajusco.upn.mx

Abstract

This paper presents concisely a long-term project made with the purpose to improve the Mexican indigenous elementary education, as well as its initial development consisting in a training experience for teachers in Oaxaca, the state with larger native population in Mexico. This experience was carried out with several actors of elementary education: teachers, technical pedagogical advisors, and principals from general and indigenous primary schools; and also with higher education teachers from one of the indigenous teachers' training school (Escuela Normal Bilingüe Intercultural de Oaxaca) and from the bachelor's degree in indigenous education of the National Pedagogical University (UPN). The students' group was formed by a majority of indigenous teachers and a few mestizos.

Context

In Mexico, the main concern of intercultural education is tackling the relationship between the mestizo population and the indigenous peoples. The descendants of ancient native people, heirs of their languages and cultures, have been viewed in various ways throughout history. One of these ways is to ignore their differences, grouping them as a whole in concepts like "Indian" or "Indigenous", referring to their ethnic origin, or putting them in terms such as "farmers", "laborers" or "migrants", related to the work they do or their need to move away from their homeland, and even concepts such as "Latinos", "Chicanos" or "Cholos" when they cross the border to the US, in reference to their Mexican origin.

These homologies hide linguistic and cultural differences of those who speak one of the 364 national indigenous American languages today officially recognized. One of the risks of the current policy of intercultural education for every one is that, again, these people are ignored in their differences and particularities. This situation leads us to consider the importance of indigenous participation in materials and contents development for indigenous education.

In 2005, Mexico had 103 million inhabitants. From the 90 million who were 5 years and over, 6 million spoke an indigenous language, 6.7%. Oaxaca is the state of the Mexican Republic with a larger indigenous population: of those who are 5 years and over, 35.2% (1.1 million) are indigenous language speakers; most of them also speak Spanish (INEGI 2005).

Compulsory basic education nowadays has 10 grades: 1 of kinder garden (5 years old), 6 of elementary or primary school (6 to 11 years old) and 3 of secondary school (12 to 14 years old). Most people attend the general education system. However, there are some subsystems that work with specific populations: the indigenous education subsystem that includes kinder garden and elementary school; the elementary school for migrant laborer

children; the TV-secondary school; among others. For the elementary school, the Ministry of Public Education produces and freely distributes, for children, textbooks of national implementation by subject, and, for teachers, various materials by grade and subject. In some subsystems specific materials are used, particularly in indigenous education, textbooks are developed in various languages, by cycle of two school grades, in some cases with an additional reading book, which are used in addition to the national textbooks.

The mathematical education in elementary school is constructivist and strongly influenced by the French school. It focuses on problem resolution by children as a way of learning. Within the school context, the teacher must take advantage of the children's prior knowledge as well as their environment reality, and she or he must also design problems, choose activities, encourage children's reflection, guide the discussions, etc. In the indigenous elementary school, there are no specific mathematics materials, even though some of the textbooks by cycle include math elements, essentially in counting. The ones who can and should incorporate context elements, culture, and language in mathematics class, are teachers, however, they have had a process of acculturation through education that makes it hard for them to do it.

In Mexico, there have been education programs or actions for indigenous population since the colonial time. In 1997 happened the last formal change of policy in this subsystem; it was changed from the "indigenous bilingual bicultural education" to "indigenous intercultural bilingual education".

Until a short time ago there were supposed to be in the country 56 indigenous languages with dialectal variants; in January 2008, 68 linguistic groups and 364 Indo-American national languages were officially recognized. In Oaxaca, we find 15 of those groups and 176 of these languages. The alphabets to write these languages are not yet unified and transmission of knowledge and their own culture is oral (INALI 2008).

"The language normalization as an extremely complex process requires, therefore and among other things, the use of the multidisciplinary knowledge reached about the indigenous languages; the will, organization and participation of the communities; the involvement of federal, state and municipal authorities; the achievement of necessary basic research; the indigenous people training in areas of public policy and linguistic planning; the conception, design, development, implementation and evaluation of guides, handbooks, questionnaires, teaching methods, didactic materials, informational-and-training texts; and other related products. It is highly important in the normalization process always to consider the practical applications of all kinds of projects that lead to the knowledge systematization of the indigenous language and culture, and to set that knowledge into the social sphere, such as: a) the establishment of alphabets, unified and supported from phonological studies, and their socialization among all its agents; b) the development of grammars for school use, based on morphosyntactic studies; c) the production of reference dictionaries for school and community use, sustained from lexicography." (INALI 2008, 16).

Many of the indigenous education teachers have not had formal training to be teachers;¹ after the elementary, secondary or high school they had a three-month teaching induction course to enroll as entitled teachers.² The UPN opened in 1990 a program that offers a bachelor's degree to in-service indigenous teachers who have finished high school. This program has been offered in 25 campuses of the UPN, including Oaxaca.

In recent years, the training for elementary school teachers in indigenous environment has been differentiated, and indigenous teachers' training schools have been created that suffer a lack of well-trained human resources to carry out its work.

The Tlacuache Project

Since the 80's the UPN has offered some indigenous training programs, bachelor's degrees, certificates, and master's degrees. Most of the participants in the project that we hereby present are involved in five of these programs. At UPN Oaxaca's campus, the teacher Aldaz, who is an indigenous Mixe with a long career in ethnomathematics, formed the Tlacuache group, with which he carried out some projects. In 2002, this group tried to start a master's degree in Mesoamerican mathematics education to train specialists in ethnomathematics but it lacked resources, specifically of skilled staff in mathematics education.

Some teachers from the UPN Ajusco's campus joined this group to make a long-term work plan (10 years), the Project Tlacuache that, as a goal, seeks to improve mathematics education in elementary school in indigenous environments.

Because of Oaxaca's special situation, and the working group's background and ideology, we decided to explicitly focus on indigenous education.

There is a wide range of issues that we want to attend:

“The efficiency level in teaching and learning mathematics in basic education in Mexico is generally very low, particularly in the indigenous environment. The basic education teachers do not have enough training to properly address the problem of teaching mathematics and much less to do it in a fashion that is adequate for the specific culture they work with.

¹ An indigenous teacher's typical story is the following: "[...] they study the first three grades of elementary education in their community, in a school whose main purpose is to teach Spanish; 4th, 5th and 6th grades were studied in a regular school in another village and living in an indigenous hostel school. Then, they go to secondary school in the head municipal town, again far away from their home. At the end of high school, at 19 years old, they incorporate as a certificated teacher in the indigenous education subsystem in a community that speaks the same language, but with a different dialectal variant." (Bengoechea, 1998).

² The people with minimal studies (elementary until about 30 years ago, junior high school until about 15 years ago and now high school) are hired as permanent teacher and while they work, they study a bachelor's degree on holiday or weekends. This "training" antecedent can be found since the Vasconcelos' period (1921-1924), from that time on the State has had the task to incorporate the rural population to the educational system. The training methods and styles have changed since then; however, the process obeys the same political purpose and faces insufficient human resources.

“On the other hand, there are not enough researchers to set up a proposal on mathematics education that is culturally relevant for the country, especially for indigenous peoples. [...]

“In the state of Oaxaca, this problem affects 16 indigenous peoples [...]. The indigenous education subsystem of the State Institute of Public Education of Oaxaca (IEEPO) only serves 355 from 570 municipalities. In this subsystem there are 420 principals and 8763 indigenous education teachers serving 215 558 indigenous children. Of these teachers, 926 have a bachelor's degree, and among these 850 are graduates from UPN [...].

“In the political dimension nowadays, an emphasis is put in the country on intercultural bilingual education, and targets are set up to strengthen the development of mathematics and scientific skills in basic education. In the field of universities and institutions of research and training in mathematical education this is a critical moment to conform a group of researchers who may propose alternatives to the problem and train new generations of researchers in the topic. For the time being there does not exist in Mexico a sufficient critical mass of researchers to generate and ensure the continuity of a master's degree in this topic. In addition, it is necessary to increase and renovate the small team of teachers, mostly senior professors, who are studying mathematics education in ethnic groups.

“For these reasons a project is stepwise outlined to generate both this critical mass and products in the short, medium and long terms.” (Aldaz et al. 2003).

In consequence, the Tlacuache Project proposes in a long term to consolidate a group of self-managing researchers to develop a Mexican line of ethnomathematics with suitable culturally educational proposals. In the short term, it was decided to start the group with specific tasks including: keeping a joint training seminar; studying master's degrees in related topics, and creating a Certificate³ in Mathematics Education and Interculturality. The latter should have a propositive focus for elementary school teachers that enables them to critically analyze their culture and school curricula in order to change the educational practices that prevail (Aldaz et al. 2003).

The UPN teacher's team that put together the Tlacuache Project and carried out the experience that is hereby presented was formed, in Oaxaca, by Isaías Aldaz Hernández, Alberto Díaz Acevedo, Juan Martínez Castañeda, and Teodoro González Agustín; and in Mexico City by Natalia de Bengoechea Olguín, Edna González Quiza, Francisco Javier Moreno Torres, and María Guadalupe Bonfil y Castro.

We now present here some experiences and results of the beginning of the project and an *a posteriori* analysis of some elements.⁴

³ At UPN, a certificate (“diplomado”) is considered a professional-update program. It is not a postgraduate program, but aims at deepening or updating knowledge, abilities and skills of professionals and technicians, taking in account their labor in the working field.

⁴ The first year and a half of the project was carried out with a strong material and economical support from the UPN's Dean and a grant from the Ford Foundation titled "To launch a teacher education program that integrates indigenous mathematics into the primary school curriculum" (Ford Foundation Grant 1035 - 1187, June 2003 to November 2004).

The setting up of the project

The collective development of the Certificate in Mathematics Education and Interculturality was chosen as the main issue of the initial work. With this certificate, we expect to strengthen the training of elementary school teachers, at least, in relation with the mathematical school knowledge, with the current approach of teaching the subject in the country, and with the way that elements can be taken from the context to make this education meaningful and relevant (Aldaz et al. 2004b).

The development of the certificate became an in-service training action of the project's academic staff. This action was linked to the required disciplines to the curricular design, as well as to the planning, development and evaluation of the curriculum's implementation; it was also linked to the knowledge's fields of ethnomathematics, interculturality, mathematics education, and teaching and research methodologies.

The certificate's original design included all the mathematical contents of the national elementary education, ICT learning, and the ethnical contents we already knew that would appear in the students' contexts. In addition, we decided to carry the work out through the presentation of problems, following the basic education approach in our country. We designed six 40-hour modules, divided into 12-hour sessions which would consist of 8 hours on Saturdays and 4 on Sundays every two weeks, and two one-week intensive periods in school holidays, a total of 240 hours.

The setting up of the certificate

The certificate was developed from September 2003 to May 2004. It was carried out with 29 students who worked in the field of education in the state of Oaxaca. They were from 26 to 59 years old and had work experiences ranging from 4 to 40 years. Half of them were female and half were male; 13 of them worked in Oaxaca City and 16 in other towns, some of them far away from the state capital. Twenty-four of the students belong to a native ethnic group, only eighteen declared to be speakers of their language group, and they have different levels of proficiency in its writing and reading. Twenty-eight of these students had a bachelor's degree in education and one was studying it at the time (Aldaz et al. 2004a).

The 16 languages that were present at the diploma were: Chatino from Yaitepec, Chinantec, Mixe, Mixe from the high zone, Mixe from the middle zone, Mixtec, Mixtec from San Antonio Huitepec, Mixtec from San Juan Ñumi, Mixtec from Santa Catarina, Mixtec from Santa María Cuquila, Zapotec from the Valley, Zapotec from the Quiatoni area, Zapotec from the Isthmus, Zapotec from the North Sierra, Zapotec from the South Sierra, and Spanish. This permitted to make working teams by language on several occasions.

The working history of these students is closely linked to their academic history, which may explain why only eight students were trained in teachers' training schools, and twenty-one were admitted directly to the bachelor's degrees of UPN. Four of the teachers' training schools' graduated students have a bachelor's degree in elementary education and the other four were trained as teachers of elementary education after secondary school; from these, three subsequently joined the UPN to get a bachelor's degree.

This certificate's students had had their professional training while simultaneously working and studying; they had to commute from the communities they worked at to the sites where they were trained, although that could involve long distances (8 hours by bus). The jobs of these students are: 16 elementary school teachers with group, 9 elementary school's principals (four in charge of a group), 6 pedagogical advisers or supervisors in elementary education, in general or indigenous elementary schools, and 2 indigenous training school teachers.

In order to do a follow-up that allowed to document and to evaluate the process, all the sessions of the certificate were video-recorded; the analysis of this material is yet incipient.

With the main purpose that students became familiarized with a meaningful use of computers⁵ and that they owned the elementary school materials, they were introduced in the use of "*My assistant. A didactic tool of mathematics for primary school teachers*",⁶ which was used as a basic working tool in the certificate. The use of computers was permanent; students learned the basic operation of common software to develop their jobs and of some mathematics applications useful in the elementary school.

The modules should be developed

"in such a way that, at the beginning, students have a life experience with the current approach in mathematics teaching in our country. The depart is a problematic situation, taken when possible from some indigenous community context, which will be related to the topics in the national mathematics curriculum; students will be lead to confront it, to develop their own solution strategies, and to compare and analyze their answers. A reflection will be made about the experience, about the elements of the problematic situation (context, mathematical contents, what arises as learning, the knowledge that it puts at stake, its difficulty components) and about what it takes to design a problematic situation with the same mathematical contents in the different school contexts in which the students work." (Aldaz et al. 2004b).

Each session has a guide, which is distributed at the beginning of the session or during the previous one, which describes the activities to carry out, the needed materials, and the homework for the next session. The homework always includes developing activities for children with the studied contents adding the community context, and trying them out with their students.

Each session was evaluated several times, in the first place to organize the next session, and thereafter to make a better version to be used in subsequent occasions.

Because of this continuous work of follow-up and evaluation, after the three first modules it was decided to change the structure of the certificate. It became a certificate of five 40-hour modules and two 20-hour integrating workshops. The purpose of the workshops was to

⁵ At that time the Ministry of Education was beginning to supply all the schools in the country with at least one PC per classroom, and, in some schools, special classrooms with 20 computers were installed.

⁶ Website developed by the UPN in collaboration with the Mexican Mathematical Society, which includes the math materials of elementary schools of SEP , an analysis of these and additional materials for teachers (de Bengoechea et al., 2003).

integrate the school and the ethnic contents within school activities, and to analyze both the difficulties in gathering cultural information and the concept of interculturality; the first workshop is carried out after the third module and the second one at the end. In order to accomplish this, we redistributed the contents and time slots.

The certificate's final version was made with the following characteristics, paying particular attention at the in-service indigenous teachers' possibilities to take it:

"The curriculum is flexible in several ways: each module is independent from others; the order can be determined depending on the students' characteristics; the contents, activities, and work materials can be modified, as long as the goals can be reached; each module may be taken independently as a short course.

"This structure allows for different schooling modes: full-time classroom classes, part-time classroom classes, on-line, and during a school year or in intensive periods.

"Given that the mathematical education is approached in an intercultural fashion, the activities designed by students can be inserted in various socio-cultural contexts." (Aldaz et al. 2004b).

Some findings in the certificate's setting up and in activities simultaneously carried out

We report here some of the situations that we found in the certificate, although we already knew some of them, because it allows us to make a radiography of the difficulties of designing culturally relevant materials for indigenous peoples.

About language and mathematics

1. The indigenous education teachers do not always speak the language or the dialectal variant of their workplace and they are not always able to learn it.
2. Few indigenous teachers can read and write in their language.
3. In all indigenous villages where there are people who speak their language, counting is in use in that language, affected to a lesser or greater extent by Spanish, and different social sectors use it: mainly elders and traders, although in some cases the use is general. In many places, the numbers are kept until 99 with a vigesimal structure, from 100 on there are some borrowed words or structure from Spanish, and in rare cases we find the word for 400. In some languages, for example Chinantec, numbering is entirely different for counting living or sacred beings for the culture, or for counting inert things.
4. In all indigenous villages, there are anthropometric measures in use: span, jeme, finger, ell or cubit, armful, step, etc.⁷
5. In many indigenous villages, land is gauged by capacity measures, mainly in gourds: they count how many corn-or beans-gourds must be used for sowing the land.

⁷ Cubit: the length of the forearm from the elbow to the tip of the middle finger.

Jeme: the distance between the tip of the thumb and the tip of the forefinger, when they are held as far apart as possible.

6. In all indigenous villages, some measures are in use that are inherited from the Colony or introduced by the trade, that are no longer of general use, and that do not have the same meaning everywhere; in some cases, indigenous people think these measures originated in their own culture: arroba, quintal, carga, pound, vara, etc.⁸

7. In all indigenous villages, there are techniques in use to build some polygons and some polyhedrons, for example for house building. However, these practices are increasingly reserved for specialized sectors of construction. The local language often does not have a word of its own for the geometric shapes and solids, and the name they receive depends on their use.

8. In some concepts, differences between languages can be strong. For example a Zapotec teacher from the Valley tells us "in my variant the concept of measuring is very wide, it is used in any context", while a Mixe teacher from the middle region tells us "kijpx is to measure, ... it's not the amount but how much it fits there, kijpx ... [is used] when something is equal".

About the social situation

1. There is a large migration to the United States.
2. The school and teachers could be a factor of social breakdown if they do not go with local traditions like tekio.⁹ A teacher tells us "We, the teachers, have broken the community structure [...] the school has been taken against the community [...] people do not want to participate [with the school] any more because the school no longer belongs to them but to the teachers."
3. In some communities, there is a resistance from teachers and parents to bilingual education, they want it in Spanish.
4. In some places, only adults or elders speak the native language.
5. In some places, the indigenous population is almost monolingual in their native language, in other places in Spanish.
6. Indigenous people are blended with the rest of the population and deny their origins, including some of our students who were gradually accepting their close ethnic backgrounds.
7. There are schools where children are bilingual in their native language and English, due to migration. There are others where children are trilingual because they speak Spanish too.

⁸ Arroba: unit of weight and of liquid measure, varying according to region.

Carga: 140 kilograms (about 308.6 pounds av.), also a unit of dry capacity, approximately 181.63 liters (about 5.15 U.S. bushels).

Vara: a long, thin, clean branch of any plant, approximately thirty-three and one-third inches.

⁹ Tekio is community work that is done without payment and is obligatory in many communities as a contribution to public works.

About the relations of the certificate's teachers with students, curriculum and cultures.

1. The culture of the certificate's teachers, or the acculturation suffered because some of us have a very close indigenous root, makes it difficult for us to easily understand another way of seeing the world. For example, understanding that different languages use concepts in different ranges and adapting to this variety in a discussion. We expect translations word to word even though we know this is not always possible.
2. The academicist training we have received makes us sometimes overestimate the mathematical contents at the expense of contextual curriculum and school topics. This prevented us at the beginning of the certificate from correctly guiding the design of school material that would incorporate the students' context. Both the students and the teachers of the certificate need to undergo an enculturation process to correctly value the context.
3. Teachers, even the oldest, are widely open to learn and recognize their mistakes or particular shortcomings of their background in the tackled contents.

We must reduce our expectations about the certificate

In three of the six main topics of the mathematics curriculum in elementary education, numbers, geometry and measurement, we obtained some terms for mathematical concepts used in students languages. Those terms do not always coincide with school concepts and the obtained descriptions are limited. Our expectation was to get hold of a relatively wide collection of mathematical terms used in students' native languages in each of the six main topics.

We hoped to obtain a relatively wide collection of mathematizable situations, linked to the participants' cultures. The approach to carry out this work was not clear enough and both students' and teachers' acculturation, together with the established workload from each session to the next one, helped to identify only a small amount of these situations.

Most students were able to develop school activities in their own language, some of them included the cultural context of their school, and some were tested and came out as appropriate for the local culture, children and school curricula. However, we consider necessary to reinforce this work, and to achieve the design of more activities and their application in school.

We pretended that all students master the entire mathematical contents of elementary school. This was partially achieved: 62% of all students passed the certificate, and this rate within modules varied from 62% to 75%. It is worth mentioning that on the one hand, the tests we applied were very biased towards traditional mathematics and we gave them much weight, and on the other hand, the students had many difficulties to develop children activities. We consider these passing percentages successful because, as we have mentioned, the elementary school teachers' mathematics training is very weak.

Samples of work in the first generation of graduates in the certificate

As a sample of the work that was carried out in the certificate, we transcribe in a free way one of the home works of a Zapotec teacher. This is a report of an activity done with children from one of the schools she works with as a technical pedagogical advisor (ATP):

Target: To know how far the students count and what they count in their own language.

LET'S COUNT THINGS

- To cover the school area with the intention of counting the things that they watch, and at the same time register them in their native language.

- Command -

Guhl rial toh gobii Scuel tsaacuent riate ria kos ni rien rian, gol liaaza lo xquieheta gol kua lahna y liak naka.

After returning to the classroom, each child spoke about what they had written. I asked them to do this in order to know how far they count in their language and from where on they use Spanish.

With this activity, I realized that of the 22 students from the school group, most of them, 14, count until 12, 5 count until 10, 2 count until 8 and 1 count until 6 in Zapotec.

At once, they were grouped in teams of 4 and 5 members to analyze what each member did, to enrich their work and to write down what they considered necessary.

Through this activity I found that children, to count people, and to say for example 2 people they said Chop rabehn, but yo say 2 tables they said chop rama (or chop rahma)

As this analysis shows, in this indigenous language, to count things that are alive people use different words than for counting things that are not alive.

When the students presented the teamwork some of them were bored, I asked them why they did not like to count in their language and the answer was:

Students: Teacher, we are bored because we cannot count as we do in Spanish, and we cannot write it as it should be, so we are angry and bored.

Teacher: And what would happen if among all of us we researched the Zapotec counting, and in the meantime I show you how far I count and write Zapotec numbers?

In that moment, I showed them with my card with Zapotec numbers from 1 to 100.

Here I watched the children's reaction of joy and interest to know numbers in their language; they considered it already lost.

After this they grouped in teams of 4 members in order to talk about how they count at home, on the land and what things they count.

At last, each team delivered a final draft where they showed how they count at their home, on the land, and what they count.

Some student's final drafts:

Platica con tu equipo que cosas se cuentan en esta comunidad y como lo cuentan.

- 1 El huaje lo venden por manojos, 1 en
- 2 El tomate y miltomate lo venden por jicara y por kilo, lo pesan en la báscula.
- 3 El shigol lo venden por puños, 1 puño en cada bolsa.
- 4 El rancho lo venden por litro lo llaman y lo miden en una bolsa.
- 5 La gladiola la venden por docenas, es por 12 gladiolas.
- 6 La semilla del café lo venden por kilo, lo pesan en la báscula.
- 7 La flor azucena la venden por flor.
- 8 El durazno lo venden por kilo y según su tamaño ya lo trocen en bolsa.
- 9 La sandía lo venden según su peso (kg) lo pesan con báscula y le ponen precio.
- 10 La hoja del platano lo venden por docena (12 flores)
- 11 El chile pasilla lo venden por puño, lo miden un puño en un puño.
- 12 El frijol lo venden por almud y kilo, lo pesan en la báscula y tiene una una botecita especial.

Platica con tu equipo que cosas se cuentan en esta comunidad y como cuentan.

El huaje lo venden por costal en nuestra comunidad, las personas que lo compran, lo llevan a la ciudad y ahí lo venden por manajo o por kilo.

En nuestra comunidad los campesinos venden sus ajotes por kilo, por jicara o por marrajal y dependiendo como son los ajotes y así sacan su precio.

El shigol lo venden por latita de chile o por jicara o por almud, y de ahí sacan su precio dependiendo el trabajo que lo cortan.

El rancho lo venden por vesito o por jicara o por almud depende del tamaño de los ranchos sacan su precio.

El miltomate lo venden por jicara o por caja, dependiendo su tamaño sacan su precio.

Mathematics Education's Network

At the end of the certificate, students decided to create a mathematics education network. Nine of those teachers achieved to organize periodic meetings with the purpose of advancing in mathematical knowledge and its teaching. The topics they tackle are defined from the problems they confront in their daily work; sessions are guided by a group's member, supported in planning by a teacher from the project.

What followed after and what follows now?

The next year and a half a seminar was carried out among some teachers from UPN Ajusco, some teachers from UPN Oaxaca and some of the certificate's graduates who constituted the network. The sessions were carried out by video conference.

In this period, my work in this field was different: In the effort to open ways to design materials for indigenous education, we set up to complete a web page with children activities in Triqui language, which we incorporated in "My assistant" (<http://miayudante.upn.mx> see "Actividades en Triqui").

After some time dedicated to postgraduate studies and other outstanding activities, teachers from Oaxaca have restarted the seminar and they are getting organized to offer the certificate again. We must analyze the data we have, and organize and incorporate it in the work with the new generation. In addition, it is time to evaluate the impact of this work in the first graduate's schools and in our teaching development.

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