REFLEXIÓN

ELEMENTARY MATH INSTRUCTION FOR BILINGUAL EDUCATION MAJORS: AN INTERSECTION OF PEDAGOGIES

Rigoberto Castillo

rcastillo@udistrital.edu.co

Sandra Rodríguez Orjuela

sandrarodriguezorjuela@gmail.com

Adriana Villamarín

adri1co@yahoo.com

Abstract

This article reports a study on the intersection of Foreign Language and Math Pedagogy. The settings were an undergraduate Bilingual Education program in Bogotá, where one of the co-authors lectures, and an international bilingual school, where another of the authors teaches elementary math. The problem addressed was the fact that pre-service teachers leave with a strong background in language, while the educational sector, in which they will work, has a high demand for bilingual content area teachers. We look into how Bilingual Ed majors perceived their readiness to teach content and how they assessed training taken in elementary math teaching*. Seven trainees received a 20-hour course that drew on key aspects of Content and Language Integrated Learning (CLIL) and Early Childhood Mathematics (ECME). We gathered data on what happened during and after the training, and on how trainees felt about what was happening. We used field notes, observations, interviews, questionnaires, self-evaluation and co-evaluation formats. In addition, five in-service teachers of an international school took an interview. The results suggest that by understanding math pedagogy, participants increased their repertoire of teaching techniques, English Language Proficiency, and. self-confidence.

Key words: *Bilingual Education, Content and Language Integrated Learning, Early childhood Mathematics, pre-service teaching, teacher education.*

Este artículo reporta un estudio sobre la intersección entre la pedagogía de lenguas extranjeras y las matemáticas. Se realizó en un programa de educación bilingüe de pregrado en Bogotá, donde uno de los coautores imparte clases, y un colegio, donde otro de los autores enseña matemática elemental. El problema identificado consistía en que los docentes en formación tenían una sólida formación en idioma, mientras que el sector educativo, en el que trabajarán, tiene una gran demanda de docentes bilingües en el área de contenido. Indagamos cómo los participantes percibían su disposición para enseñar contenido y cómo evaluaban la formación recibida en la enseñanza primaria de matemáticas *. Siete docentes en formación recibieron un curso de 20 horas que se basó en aspectos clave del Contenido y el Aprendizaje Integrado del Lenguaje y que tomó en cuenta las Matemáticas de la Primera Infancia. Recopilamos datos sobre lo que sucedió durante y después de la capacitación, y sobre cómo se sintieron los alumnos sobre lo que estaba sucediendo. Utilizamos notas de campo, observaciones, entrevistas, cuestionarios, autoevaluación y formatos de coevaluación. Además, cinco profesores en servicio del colegio internacional tomaron una entrevista. Los resultados sugieren que, al comprender la pedagogía matemática, los participantes aumentaron su repertorio de técnicas de enseñanza, dominio del idioma inglés y. auto confianza.

Palabras clave: AICLE, Aprendizaje Integrado de Contenidos y Lenguas Extranjeras, educación bilingüe, educación temprana en matemáticas, formación de docentes.

*Acknowledgements to our colleagues Jaime Galindo from UNICA and Deisy Baracaldo, from Universidad Libre who provided valuable insights on this project.

e bilingual education (Ed) program, where we conducted the study, claims to prepare students to pursue a career as a bilingual teacher educator, however most of the credits correspond to teaching English as a foreign language. Both government and private schools in Colombia are requiring bilingual teacher to teach content areas. The gap in this preparation moved us to inquire on how to prepare our Bilingual Ed majors.

The demand for contextualized methodologies has become stronger; for example, programs like the one at Texas A & M (2018) prepare Bilingual Ed undergraduates in first and second language, history, politics, science and mathematics. Furthermore, the increasing need for communication skills in English has created a huge demand for quality English teaching around the world (Richards, 2006), and the tendency is to integrate the teaching of language to the teaching of disciplines. In that scenario, pre-service teachers of a Bilingual Education program in a university in Bogotá D.C, had not been prepared to respond to the academic and language demands of schools, which use English as a medium of instruction. The curricula showed that students took one subject in Content-Based Instruction, yet the diagnostic survey indicated that the course fell short in preparing alumni to teach a subject through English (Appendix B). To establish the problem, we also surveyed five in-service math teachers of the international school who expressed not having received training to teach content at the university; they claimed they were able to teach it because they studied

by themselves, took workshops or received tutoring; they added that math was the most demanding content area.

This collaborative action research developed by a lecturer in the Bilingual Ed program and an elementary math teacher sought responses to the following question: How may a training program in math teaching enhance the competencies of a group of bilingual pre-service teachers? To conduct the inquiry, we consulted literature on Content and Language Integrated Learning
(Coyle, Hood and Marsh, 2010) and Didactics of Mathematics Education (National Council of Teachers of Mathematics, 2000).

Content and language integrated learning (CLIL)

This research examined CLIL, a dual-focused educational approach in which content instruction uses an additional language. According to Coyle, Hood and Marsh (2010), in a CLIL classroom and in a CLIL medium term planning it is necessary to focus equally on how students meet the content subject -the input and what they do while learning, that is how they process the input. The purpose of training bilingual Ed majors was to familiarize them with elementary math pedagogy that has proved beneficial. Navarro and García-Jiménez (2018) established, with empirical data drawn from seven state schools and one charter school, that the CLIL methodological approach had a positive

effect on pupils' language attainment in use of English, vocabulary, listening, speaking and reading.

In the first stage, we promoted reflection on the shared vision of CLIL (Mehisto, Marsh, and Friguls, 2001). In the second stage, we examined and personalized the CLIL context for trainees to co-construct ideas and actions that would materialize in a first-grade math classroom. The third stage consisted of four planning steps using the 4Cs framework: *Content, Culture, Communication* and *Cognition*, which for Coyle, Hood & Marsh (2010) cannot exist as separate elements. The 4Cs framework considers that strengthening and deepening a learner's conceptual understanding requires social, cultural, linguistic and cognitive processes; the 4Cs conceptualize CLIL holistically.

The fourth stage in our teacher training entailed preparing units; a planning mind map translated into the application of materials, resources, tasks and activities. The fifth stage consisted in monitoring and evaluating CLIL in action, which was a fundamental step to integrate the teaching and learning process in a Unit checklist. We considered two aspects of CLIL: 1. the pedagogy of math, and 2. The interface of teaching mathematics through English.

Didactics of Mathematics Education

To understand the context of mathematics, it is important to consider this subject as the core skill for everyone, math is fundamental in science, culture and everyday life. Math considers aspects such as logical reasoning, problem skills and the ability to think in different ways. At the same time, it contributes to numerical and reasoning aspects in all settings. National Council of Teachers of Mathematics (2000) released a document named Principles and Standards for School Mathematics for empowering math teaching. The six principles that appear below guided the understandings and actions of this project:

- ***Equity***. *Excellence in mathematics education requires equity—high expectations and strong support for all students.*
- ***Curriculum***. *A curriculum is more than a collection of activities; it must be coherent, focused on important mathematics, and well articulated across the grades.*
- ***Teaching***. *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- ***Learning***. *Students must learn mathematics with understanding, actively building new knowledge from experience and previous knowledge.*
- ***Assessment***. *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- ***Technology***. *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught, and enhances students' learning.* (p.2-3)

The training drew on Early Childhood Mathematics (ECME) trying to strike a balance between a very direct, didactic, and teacher-centered approach to ECME, and a play-based, child-centered, non-didactic approach to ECME (Sherman-Levos, 2010). Trainees worked on the principles and strategies, standards and vocabulary to teach measurement, geometry,

math operations, and problem solving. They kept in mind that learning mathematics requires children create and recreate mathematical relationships in their own minds. (Burns, 2007).

Principles and standards helped us choose the steps to classify the knowledge suitable for a first grade based on the understanding that in elementary first grade, young children expand quantitative competencies, acquire language and with it, the ability to count. First graders should become capable of demonstrating a range of math competencies, numerical estimation, comparison, simple addition and subtraction that emerge spontaneously without much explicit instruction. To attain the goals trainees worked with didactic the four operations and other concepts; some of these materials were: colorful cubes, lotteries, set of number, figures, chips, puzzles, pattern figures, counters, Cuisenaire rods, math operations boards, open and closed abacus, and dominoes.

Method

This project took place at a private university with seven senior bilingual education majors. They were volunteers, and they filled and signed a consent form. The research methodology was Collaborative Action Research, facilitated by university-school collaboration to study classroom action (Burns, 2009). The teacher-researchers being a

university lecturer, an elementary math teacher and a research advisor. As Stewart (2001) asserts 'action research forces teachers to think about what they are doing in the classroom in a systematic way through a lens focused on one particular area of their practice' (p.87), in this case, our lens focused on elementary math teaching through English. In the diagnostic stage, we gathered information about the trainees' current didactic competence while five in-service teachers at the international school gave their views on their initial preparation and on the challenges of math teaching through English.

We analyzed and triangulated the data. For Creswell (2008), triangulation consists in corroborating evidence from different individuals with data such gathered in field notes, and case studies. We analyzed the effect of training on the quality of the trainees' way of explaining, on the quality of their lesson plans and on their performance in microteaching. Pre-service teachers took an interview on the assessment and impact of the training course.

Instruments and Procedures

The validation of an instrument is understood a methodological procedure by which to determine the capacity of an instrument to accurately measure that which it is intended to measure. In this case, the survey questionnaires (Appendices A and B) underwent the revision of two experts. Two professors with experience in teacher education and research.

We also used survey classroom observations, video recording, interviews, a discussion forum, and assessment grids (AG). The first questionnaire applied to five in-service elementary math teachers of the international school (Appendix A) and to the seven trainees (Appendix B) explored background and expectations and provided insights on issues on teaching content areas. The purpose of these questions was to obtain information about their views on their didactic competence for teaching content areas.

On the other hand, classroom observation grids served to collect information on the microteaching that made part of the training sessions (Chart 1). The items derive from CLIL for the description of the achievement of the goals proposed, the clarity of the content, cognition, culture and support for learning language and communication. (Coyle, Hood and Marsh, 2010).

Chart 1. Classroom Observation Grid used in microteaching

CLIL Unit Checklist

Theme..... Date.....

Unit of work..... Session.....

Clarifying global goals, teaching aims and learning outcomes
_____Are the global goals (vision) embedded in the unit planning?
Content
_____Are the teacher´s presentations of new content clear?
Language/Communication
_____Are students involved in learning language? Are there adequate opportunities for them to practice the new language structures?
_____Have the students got adequate vocabulary/language to answer my questions?
Cognition/Thinking
_____Has the teacher considered how he/she could ensure learners' progress cognitively? And how to measure progress?

Culture _____Has the teacher considered how the theme of this unit promote awareness of cultural difference /global citizenship? **Activities** _____Do the tasks designed relate to the global goals, aims and outcomes in terms of the 4 Cs? _____Is this an initial /progress/summary/assessment activity? **Supporting learning** _____Are there adequate opportunities for students to engage in practical activities to experience CLIL? **Assessment** _____Has the teacher considered how the learners would know what they have learnt? **Reflection** _____Is there variety (groups, pairs)? _____Has he/she thought about what might be changed in this unit?

Own production (2018)

While the above observation Grid captured microteaching, field notes and video recording established the consistency of the data. Field notes described each lesson taking into account the material used, the activities and the steps of the math class. These also collected the students' assessment of the microteaching.

Assessment formats for self-evaluation and Co- evaluation, in Chart 2, captured the trainees' perceptions about task realization, their opinions in terms of what they liked the most, their capacity to follow instructions, the contribution to their teaching methodology and the evaluation of fluency, pronunciation, and interaction strategies, etc.

Chart 2. Self-evaluation and Co-evaluation Format used by trainees

Student´s Name: Date: Instructor:	Subject: Topic: Level:

SELF EVALUATION	**CO- EVALUATION**
1. What I liked the most about the realization of this task was: 2. What I didn't like about the realization of this task was:	1. What I liked the most about my classmate´s task realization was: 2. What I didn´t like about my classmate´s task realization was:
3. Presenting, I felt: a. Nervous b. Bored c. Motivated d. Self-confident/ comfortable. 4. Were you able to accomplish the task according to the instructions given by the teacher? Yes_____ No_____ 5. From 1 to 5 (5 being the highest score), rate how well the realization of this task allowed you to learn more English and put into practice your oral communication skills. _____ 6. From 1 to 5 (5 being the highest score)How do you evaluate your: Fluency_____ Pronunciation:_____ Interaction strategies:_____ Vocabulary:_____ 7. From 1 to 5 (5 being the highest score)How do you evaluate this task as a contribution on your teaching methodology:_____ *Coherence and cohesion* Devices: Use of connectors:_____ Organization of ideas:_____ Comments / Suggestions on what can be done to help you improve your communicative competence:	3. Presenting, my classmate seemed a. Nervous b. Bored c. Motivated d. Self-confident/ comfortable. 4. Was your classmate able to accomplish the task according to the instructions given by the teacher? Yes_____ No_____ 5. From 1 to 5 (5 being the highest score), through the realization of this task your classmate was able to use what was taught in class and put into practice his/her oral communication skills. _____ 6, From 1 to 5 (5 being the highest score)How do you evaluate your classmate´s: Fluency_____ Pronunciation:_____ Interaction strategies:_____ Vocabulary:_____ 7. From 1 to 5 (5 being the highest score)How do you evaluate this task as a contribution on your classmate´s teaching methodology:_____ *Coherence and cohesion devices:* Use of connectors:_____ Organization of ideas:_____ Comments / Suggestions on what could help your classmates improve their communicative competence:

Own production (2018)

Additionally, this instrument provided trainees with the opportunity to evaluate their classmates' perceptions. After each session, trainees filled up an assessment in which they expressed their perceptions during the training and evaluated their own and their classmates' performance. The information and comments served to develop the following sessions. The data played an important role in decision-making. In the interviews, we gathered data about the participants' assessment of the training. Participants expressed their perceptions on the impact, strategies and techniques that strengthened them by responding to these questions:

1. *What was the impact that you perceived on your teaching process?*
2. *What sort of strategies and techniques did you learn during the math teaching training?*
3. *What are the aspects you consider make you stronger in teaching math?*
4. *How the implementation of the 'Math Teaching Training' make an impact on your English proficiency and methodology?*

This study used three instruments : Observation Grid (OG), Interview Analysis (IA), and Assessment Grid (AG). Triangulation helped interpret the information on how the teachers felt in the training, how they applied the new knowledge in the lesson plans and how they performed in the microteaching. The data coming from the OG, the IA and AG served to judge the enhancement of language, of content and of the application of CLIL.

The teacher training sessions

After analyzing the data collected in the diagnosis, we designed the training in CLIL in five four-hour sessions of lectures and microteaching. In these, trainees completed a questionnaire and a teacher observation sheet. Finally, in a brief forum, trainees shared opinions and provided feedback that we collected in field notes.

In the sessions, the teacher-researchers evaluated how much trainees applied the new knowledge to the microteaching. Trainees selected a topic and a strategy to work on and received support from the trainers on the application of standards and on the language to deliver the class. In the ensuing sessions, trainers and trainees planned strategies such as *socialization, explanation and exposition*. Trainees, on their part, drafted a lesson plan and a mini project using the knowledge and resources discussed. Trainers provided constant feedback.

Results

The instruments used in the diagnosis provided valuable information. In the survey, the seven participant-students claimed not to have received preparation for teaching subjects like science math, or social studies although they had taken a course in "Content-Based Instruction." They added that the course touched upon generalities and they would need more knowledge and skills to teach content with English as a medium of instruction. This

assertion was supported by the fact that four out of seven said in the interview that they tutored students or give a content class and felt unprepared, especially in math.

The responses above coincided with the interviews of the five in-service teachers from a bilingual school. All of them affirmed that they became effective content-area teachers through years of experience. They did not receive specific training in their undergraduate studies. They added that this training was necessary for they have realized that taking math in English proves difficult for school learners.

In the questionnaire that appears in Appendix A, in-service teachers from the international school expressed that they had not received preparation at the university to teach content. They consider that the current knowledge they have allows them to teach content areas for they self-taught, got help at the school or learned by doing. They added that they had worked with fellow English-speaking teachers who struggled to teach content, and that schools should not send them to the classroom unprepared. The five in-service teachers deemed that the resources at their disposal to teach content were sufficient. They have access to excellent textbook, platforms and in the school, they work at, there has been more training in the last two years.

The first result of the training sessions suggests that these enhanced pre-service teachers' pedagogy; there was a positive move from the absolutist nature of math regarding rules,

and right and wrong answers. They stated that math teaching could be interesting and creative. The second result suggests that pre-service teachers' language proficiency increased since data from several instruments indicated that the math concepts learned brought with them a reasoning, a terminology and a language that enriched their English. The third result suggests that pre-service teachers' self-confidence increased. Trainees coincided the training strengthened them as teachers; they referred to the standards, to the didactic materials, and to their will to apply to school position to teach content.

Result No. 1. Pre-service teachers' pedagogy was enhanced

Trainees became aware that taking math in English brings difficulties to the children and challenges the creativity of instructors–as in-service teachers had stated-. Data from observation grids, assessment grids and other instruments indicated that training enhanced the participants' teaching. Their responses acknowledged teaching methodology as the most important aspect for both language and math. In addition, CLIL proved to allow trainees to implement meaningful practices for dual language use demonstrated in the microteaching.

On the one hand, pre-service teachers recognized the importance of learning the pedagogy of specific subjects. On the other hand, trainees 'discovered' math standards: they claimed

they profited from the understanding of numbers and operations, measurements, algebraic thinking, and geometry. They added they were very pleased working with concrete material and math didactic material: '*We learned not only to use a protractor in geometry to measure angles, degrees, or vertexes but also to use a geoboard and identify shapes*.' (Student 7). Others said they did not expect they could design their own material for math. The techniques that pre-service teachers cited as the most interesting along the sessions were: *Play Shape Tree Match-Up, Estimating Numbers, House Hold Measurements, Wiggly Worms Measurement, Congruency and Symmetry,* Shape Description Chants, *Three Dimensional Shapes* made with plasticizer among others. These served for teaching and assessment.

Change of beliefs about math teaching and learning are an important consideration in pedagogy. Pre-service teachers debated their beliefs about math. They came to some conclusions: math should not frustrate learners, right or wrong answers are part of the process, and that there are many procedures to teach and learn a concept. In sum, they expressed that they had false beliefs about math, but with this training, for instance student 1 stated, '*Now, I can teach Math*.' Student 3 said, '*We need to continue working and studying this, but now we have enough knowledge to teach a math class. Thanks*!' While S 4 claimed: 'I thought it would be difficult for me but now I notice that it is easier that I

imagined'.

Result No. 2. Pre-service teachers' English Language Proficiency Increased

We found that all trainees used specialized mathematical terminology and applied the knowledge constructed in the training. Trainees spoke highly of the benefits of learning math language, and of the positive effect on their English language proficiency. All of them expressed that they were able to accomplish the task according to the principles of the course. Pre-service teachers affirmed that with CLIL, they were able to understand and deliver the topics proposed.

Trainees acknowledged that they learned to use the language of math and that they put into practice the new concepts and language. They manifested they observed their own and their classmates' progress in terminology, pronunciation, and fluency. In the case of grammar, they self-evaluated and co-evaluated the use of complex structures in their oral presentations, and in the lesson plans positively. Furthermore, they evaluated themselves and their partners' presentations (Chart 2) in coherence, cohesion, and use of connectors positively.

Result No. 3 Pre-service teachers' self-confidence increased

In teacher development, having confidence not only expands the teachers' capabilities, but contributes to success. The diagnostic established that building self-confidence would be necessary to tackle content teaching. In the evaluation stage, pre-service students agreed

with in-service teachers that the teaching content and math teaching are the most demanding items. The seven trainees mentioned that although at the start of the training they felt overwhelmed by the concepts and the terminology, they developed confidence to ask questions, try techniques and explain math standards. After the oral presentations of lessons, classmates spontaneously applauded. They showed curiosity and enthusiasm when they came across the didactic material to work in problem solving. They participated constantly and simulated to be young learners. They expressed that they felt motivated and willing to explore math with these expressions: (Student 1) '*Students can use Sudoku for math fluency or algebraic thinking.*'

Student 3 'I can use the protector (Geometry resource) to identify angles!'

In microteaching, trainees became engaged; they motivated classmates to practice the four operations with color cubes, addition dominoes, etc. S1 said, '*Wow, now we can teach in elementary grades*!' S3: '*I feel prepared to teach math at a Bilingual school*,' S6: '*At First I thought it would be harder, but I felt super comfortable, and S4: I'd need more studying, but I feel I am able to teach math.* In the closing session, in which trainees obtained their certificate of accomplishment, they were very excited and thankful; they said they could not wait to teach.

Discussion

This study arrived at the same conclusions of Hudson, Henderson & Hudson (2015) in an action research study conducted with 24 of primary school teachers. They established that, in training, teachers gained confidence, and competence in relation to mathematics, and therefore, they developed positive attitudes, beliefs and expectations on what math learning entails. Our study conducted with seven bilingual education majors additionally found that they gained English language competence. In a study with 53 charter schools in Spain, Pérez-Cañado (2018) also found teachers 'satisfaction with the curricular and organizational aspects of CLIL.

The inquiry revolved around the question: How may a training program in math teaching enhance the competencies of a group of bilingual pre-service teachers? The responses moved around the trainees' confidence, competence, attitudes and beliefs in relation to mathematics teaching and their expectations and experiences as future teachers. Several factors contributed to the impact of this training: the first aspect relates to professional development. Desimore, Porter, Garet, Yoon and Birman (2002) claim that effective practices require teachers to have a deep understanding of the content. Also, Diaz (2004) and Ellis (1990) argue that professional development shows techniques that participants replicate in classrooms while experimental practices involve trainers and trainees in actual

teaching.

The second aspect connects to the assertion by Coyle (2015) that '*learner progression is about individuals becoming increasingly skilled in purposeful communication across cultures and languages using the appropriate style, mode and genre typical of their subject and their audience*' (p.6). This means that our trainees developed subject literacy across languages or PluriLiteracies. They demonstrated a better knowledge of the concepts and of math terminology. They expressed that their language proficiency, self-confidence and creativity was greater than before.

Furthermore, the understanding and application of the CLIL approach was significant for them. Following Coyle, Hood and Marsh, (2010) we focused equally on how trainees met the content subject (input) and what they did while learning (how to process input). In addition, trainees adapted subject specific methods to accommodate the additional language focus. Thus, the development of CLIL-based didactic units and the lesson plans provided trainees with tools to place math in a context by following the 4Cs: communication, cognition, content and culture.

> -***Communication*** was reflected in the language register, vocabulary and expressions pre-service teachers learnt and applied in lesson plans and microteaching.
> -***Cognition*** refers to pre-service teachers' understanding of math thinking: concepts, standards, principles and in general, math pedagogy.

-**C*ontent*** focused on elementary math: numbers decomposition, math operations and problem solving.
-***Culture*** refers to trainees' expansion of their worldview by interacting with math in English. This empowered them to try harder, and become creative and engaged to meet the demand of delivering different types of content.

This meant opening doors to ways of using a methodology. Pre-service teachers' perceptions on being a teacher changed; they broke stereotypes about math. The training touched their hearts and strengthened their methodology, language proficiency and self-confidence. One of the participant's statement summarizes the trainees' general feeling: she said, '*Thanks for all. I really like this project; it is part of the thing that I love, teaching, and it was a way to transform my world*.'

One of the limitations of this study was the short time the intervention took. Trainees expressed the need to have more time to study the pedagogy of math or to study the many resources available for content teaching. Additionally, collaborative action research demand resources of time that were not always available. Further research would require the presences of the university instructor, the advisor, and the classroom teacher in the training sessions, as well as in the primary school setting to make it a truly a university–school collaborative project in the terms of Yuan and Lee (2014).

Based on the results of this study, teacher professional development is a complex, extended and deeply personal process that has no start or end. It should focus on the pre-service teachers who are part of a teaching education program. It should continue with apprentice teachers who enter the classroom for the very first time as well as with the experienced teachers who understand and overcome classrooms dilemmas. Then, our recommendation is that subject specific pedagogies occupy a central place in the curricula of bilingual Ed and in TEFL (Teaching English as a Foreign Language) preparation programs.

References

Burns, A. and J. C. Richards (Eds.). (2009). Action research in second language teacher education. Cambridge: Cambridge University Press.

Burns, M. (2007). About teaching Mathematics, AK- 8 resource. Sausalito CA: Math Solutions Publications.

Coyle, D. (2015). Moving from the 4Cs Framework to a PluriLiteracies approach for CLIL. Transcript of Do Coyle's presentation. Retrieved from: https://pluriliteracies.ecml.at/Portals/54/GrazGroup4CsTranscript.pdf

Coyle, D., P. Hood., and D. Marsh (2010). CLIL Content and Language Integrated Learning. Cambridge: Cambridge University Press.

Creswell, J. (2008) Educational Research Planning, Conducting and Evaluating

Quantitative and Qualitative Research. Upper Saddle River, N.J: Pearson/Merrill Prentice Hall.

Desimore, L., A. Porter., M. Garet., K. Yoo., and B. Birman. (2002). Effects of professional Development on Teachers' Instruction: Results from a Three-year Longitudinal Study. Educational Evaluation and Policy Analysis, 24 (2), 81-112.

Diaz, M. (2004). Teacher-Centered Professional Development. Virginia USA.

Ellis, R. (1990). Activity and procedures for teacher preparation. Second Language Teacher Education. Cambridge: Cambridge University Press.

Hudson, B., S. Henderson & A. Hudson (2015). Developing mathematical thinking in the primary classroom: liberating students and teachers as learners of mathematics. Journal of Curriculum Studies. 47 (3), 374-398. Retrieved from: https://www.tandfonline.com/doi/full/10.1080/00220272.2014.979233

Mehisto, P., Marsh, D, y Friguls, M. (2001). Uncovering CLIL. Content and Language Integrated

Learning in Bilingual and Multilingual Education. McMillan Books for Teachers. Affective Factors and their Relation to Language Attainment. Porta Linguarum. 29, 71-90

National Council of Teachers of Mathematics (20F00). Principles and Standards for School Mathematics. (2000) Retrieved from:

https://www.nctm.org/uploadedFiles/Standards_and_Positions/PSSM_ExecutiveSummary.pdf

Pérez-Cañado M.L. (2018). CLIL and Educational Level: A Longitudinal Study on the Impact of CLIL on Language Outcomes. Porta Linguarum. 29, 51-70.

Richards, J. (2006). Communicative Language Teaching Today. New York: Cambridge University Press

Sherman-LeVos, J. (2010). Mathematics Instruction for Preschoolers. In: Tremblay RE, Boivin

M, Peters RDeV, eds. Bisanz J, topic ed. *Encyclopedia on Early Childhood Development* [online]. Retrieved from: http://www.child-encyclopedia.com/numeracy/according-experts/mathematics-instruction-preschoolers.

Stewart, J. (1991). A postmodern look at traditional communication postulates. Western Journal

of Speech Communication, 55, 354-379.

Texas A & M (2018). Undergraduate degrees and programs. Retrieved from: http://epsy.tamu.edu/degrees-and-programs/undergraduate-degree-programs/bilingual-education

Yuan, R., I. Lee (2015). Action research facilitated by university–school collaboration ELT Journal, 69 (1), 1–10. https://doi.org/10.1093/elt/ccu031

Appendix A. In-service teachers' survey

1. Select with an X the subjects in which you received previous training for teaching content areas in a second language. _ Math _Social Studies _Science _ none

2. Do you consider the didactic knowledge you have allow you to teach content areas?

__Yes __No Please explain.

3. In your experience at bilingual schools. Do you consider the teaching methods are adequate?

__Yes __No Please explain.

4. Do you consider the didactic resources that you have at your disposal to teach content areas are sufficient?

__Yes __No Please explain.

5. What is your opinion about teachers specialized in English language teaching, who accept teaching content areas through English?

Appendix B. Pre-service teachers' survey

Dear Students: The purpose of this questionnaire is to ask about the current didactic competence that pre-service teachers have applied in the teaching of content areas such as Science, Social studies and Math in bilingual schools. Please answer these questions.

1. Have you ever received an academic training to teach content areas such as math, social studies, science or others?
   a. yes b. No Which ones:
2. Have you taught content areas such as such as math, social studies, science or others in bilingual schools?
   a. yes b. No Which ones:
3. Do you consider that knowledge and didactic tools are enough for teaching content areas through English?
   a. yes b. No
4. What is your opinion about teachers specialized in English language teaching, who accept teaching content areas through English?

Thanks for your cooperation!

……

Responses

Interviewee #.1 LG

1. Yes 2. Yes 3. Yes

4. *These teachers require and need preparation in specific academic subject that schools demand. Lack of*

TicALS - Vol. 1, N° 5 – mayo 2019 – ISSN:2463-0624. Bogotá – Colombia. Páginas 169 – 195

academic background affects our country educational standards and the youth, who should receive true and quality information.

Estos docentes precisan y necesitan una instrucción académica específica de las áreas del conocimiento requeridas por las instituciones educativas. La informalidad en la educación y en la preparación académica perjudican la calidad educativa del país y de las juventudes en busca de información veraz y de calidad.

Interviewee #.2 GC.

1. Yes 2. Yes 3. Yes

4. *Learning English just to communicate won´t be profitable in medium and a long-term future. The new generations can, develop language skills such as vocabulary, listening and speaking by themselves. For this reason, English teachers focus mostly on textual production. Consequently, the introduction of subject matter teaching in the foreign language would cover a wider spectrum of meaningful teaching and learning opportunities. Similarly, in-service content area teachers enhance school curricula English and enrich the understanding of other subjects. In addition, they contribute to international communication.*

Aprender inglés con fines únicamente comunicativos no será rentable en un futuro a mediano y a largo plazo. Las generaciones jóvenes en la actualidad están siendo capaces de autoformarse en habilidades del lenguaje como vocabulario, escucha e inclusive habla, haciendo que los docentes de inglés se enfoquen principalmente en producción textual. Por esta razón, introducir contenido al enseñar una lengua extranjera permitiría abarcar un sinnúmero de opciones de enseñanza/aprendizaje; creando momentos más significantes y duraderos para los estudiantes. Asimismo, los docentes, que por oferta laboral enseñan en diferentes áreas del conocimiento, a través del inglés permiten la integración del currículo haciendo del inglés un vehículo no solo de comunicación internacional con otras comunidades, sino una herramienta extra para entender los procesos internos de enseñanza en Colombia.

Interviewee #.3 EL

1. Yes 2. Yes 3. Yes

4. *Taking into account that, as Bilingual Ed majors, we must teach content areas in English, it is a little bit worrying that most of us do not have the enough didactic knowledge to handle content areas and it affects our job performance.*

Teniendo en cuenta que nosotros, como licenciados en educación bilingüe, en algunos colegios debemos enseñar diferentes áreas de conocimiento en inglés, me parece un poco salido de contexto teniendo en cuenta que no tenemos o no contamos con la didáctica necesaria para hacerlo y de esta manera se nos dificulta en mayor cantidad el desempeño de nuestro trabajo.

Interviewee #.4 FT

1. Yes 2. Yes 3. No

4. *It is important to understand that teaching is subject to changes, and there are not too many job offers. Then we should be ready to take teaching positions that require English as the language of instruction of another subject.*

Besides, conformism or pay conditions may force us to do so. Fortunately, this is not my case; the school where I am working gave me first the option to teach and second, training for teaching content competently.

Creo que es importante entender que los licenciados estamos sujetos a muchos cambios dentro de nuestra área, ya que la demanda laboral no es tan alta y por esto debemos aceptar este tipo de requerimientos como lo es dictar materias de contenido en inglés. Además, esto se debe así conformismo de algunos licenciados en el momento de ser contratados por las instituciones y que se ven ligados en gran parte a la oferta monetaria. Afortunadamente, este no es mi caso, ya que la institución para la cual yo laboro, me ofreció primero la opción y segundo la capacitación para poder enseñar este contenido con excelentes bases.

Interviewee # 5 SR

1. Yes 2. Yes 3. No

4. *Definitively, teachers of English, have to prepare for teaching content areas, not only because bilingual schools demand it, but also because it increases job opportunities.*

Definitivamente, los profesores de inglés debemos estar preparados para dictar materias de contenido en inglés no solo porque los colegios bilingües lo exigen si no porque eso incrementa nuestra oferta laboral.

Interviewee # 6 JR

1. No 2. Yes 3. No

4. *Unfortunately, schools think that a language teacher is prepared for teaching content. This is not true. In fact, at the university we took one course in content teaching. This does not mean being trained for teaching other subjects, more training is necessary. This may explain that some students face academic difficulties, especially in math.*

Desafortunadamente, los colegios piensan que el licenciado en idiomas está capacitado para dictar todas las materias de contenido. Cuando eso no es cierto. El hecho de haber visto en la universidad una materia de contenido no significa que se esté capacitado para dictar estas materias, se necesita mucha más preparación. Esto es lo que hace que los estudiantes tengan problemas académicos. Especialmente en la materia de matemáticas.

Interviewee # 7. AV

1. No 2. Yes 3. No

4. *I consider that the certainty in educational contexts nowadays, [is that] that teachers have to be prepared for teaching not only English but also content areas. This fact could help us for having larger job opportunities. However, it is necessary to receive a training.*

Pienso que es una realidad de los contextos educativos hoy en día el hecho de estar preparados para enseñar no solamente inglés sino también áreas en inglés y esto nos puede ayudar a tener más amplio nuestro campo laboral. Pero es necesario recibir preparación.