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Mathematics as a World Language or Mathematics as a Collection of Dialects?

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ABSTRACT
A great deal of the history of research in ethnomathematics has been dominated by the ideas that are fundamental differences in ways of doing mathematics among various cultures, these differences are critical for the understanding of human nature. Based on the ethnomathematics theory, this article will demonstrate that there are different algorithms people use to solve problems as individuals and as cultural groups. Mathematics has been seen as neutral subject areas in which student background knowledge such as culture, language, and heritage are detached from the curriculum. Ethnomathematics theory provides a basis for acknowledging the structures in society that deal with majority communities concerns, it connects culture and mathematics to enable it to enrich student subject matter understanding and bridge the often perceived gap between mathematics and their day to day lives. An ethnomathematics perspective provides an adjustable space for students in society.

I. INTRODUCTION

Learning is a cultural process by which individuals from the same cultural group can construct their mathematical knowledge in a cooperative way. Mathematical learning opportunities occur with social and cultural interaction through dialogue, language, and negotiation of meanings and symbolic representations between the teacher and student. To understand these cognitive strategies, it is necessary to envisage students in the context of their own cultural context, language, and the representations which act as med iators for all actions that take place in the mathematics curriculum. Students from different cultures in conjunction with each other interact to produce certain regularities and norms to speak and act in mathematical ways according to mathematical practices. In this cultural integration, the relationship between mathematics, language and symbolic representations has an extremely important role. If the interpretation of the mathematical phenomenon of learning and understanding mathematics utilizes a semiotics approach for mathematics and ethnomathematical perspective of cultural mathematical ideas, then there are instruments to analyze the transmission of mathematical practices.

II. MATHEMATICS CLASSROOMS

For many years, many mathematics classrooms have operated on the understanding that all students should receive the same mathematical content at the same time in the same way. Some mathematics teachers believe that there is only one right way to solve a mathematical problem and one way of gaining an understanding of the mathematics, for example, the long division algorithm used in American schools. This paradigm has shifted. Many public schools are in multicultural settings with highly diverse classrooms. Mathematics classrooms are most certainly part of this environment.

In many mathematics classes, students are encouraged to solve mathematical problems by applying multiple strategies and use their own multicultural background to discover their own paths, to assist other students to learn new ideas and strategies, and to understanding mathematical concepts through the use of real-life problem solving scenarios. This kind of classroom has an eye toward equity, that is, treating students fairly by considering their different strengths, learning styles, and cultural backgrounds. Effective teachers have come to consider where their students are in their thinking and to modify instruction based on this knowledge. For example, in SDAIE classes, teachers push students to come up with as many different algorithms or strategies as possible for discussing or solving mathematical problems because each student has different ways in coming to understanding mathematical content.

III. MULTICULTURAL MATHEMATICS CLASSROOMS

The kind of mathematics classroom we strive for, is a democratic setting in which all students are active and engaged learners. Multicultural mathematics curriculum is student-centered, anti-racist and grounded in the incorporation of mathematical activities from diverse cultures, particularly those that have experienced oppression or exclusion from mainstream society. While learning to navigate the dominant culture, through mathematical curricular activities, students learn about their own cultures and assess personal assumptions that affect their interactions with individuals that are different from themselves. Two important results of multicultural education are advanced: critical thinking skills and the ability to work cooperatively. Developing an inclusive mathematics curriculum that informs each aspect of a student's education requires widespread systemic change. Methods of mathematical curricular reform may be described as a progression from adding single pieces of cultural information to transforming the curriculum so that it equally values all cultural perspectives.

IV. MATHEMATICS

Mathematics is a language that has its own symbols, syntax, grammar, and a variety of representations. It also relies on an intensive use of different types of letters to represent variables, signs for numbers, diagrams, formulas, and algorithms. Mathematics is the construction of knowledge that deals with qualitative and quantitative relationships of space and time. It is a human cultural activity that deals with patterns, problem-solving, and logical thinking in an attempt to understand the world and make use of that understanding. This understanding is expressed, developed and contested through language, symbols, and social interaction. Mathematical literacy provides powerful numeric, spatial, temporal, symbolic, communicative, and other conceptual tools, skills, knowledge, attitudes and values to analyze; make and justify critical decisions; and take transformative action in society.

V. MATHEMATICS AND LANGUAGE

The proven relationships between language skills and mathematics (Aiken, 1972; Cuevas, 1984; Dawe, 1983; Kessler et al, 1985) pointed out that a limited ability to speak English has considerable effects on the learning of mathematics. The justification for the myth of the ability to speak English having a minimal effect on learning mathematics is that mathematics is a universal language, and, therefore, an individual’s knowledge is not tied to a particular cultural language . However, one of the problems for immigrant students is related to syntax, the sentence structure and semantic components of language in the mathematics classes. Kessler et states that one area relates to the lack of a one-to-one correspondence between mathematical symbols and the word they represent.

VI. MATHEMATICS AS WORLD LANGUAGE

Mathematics is often associated with the study of universals, that is, it is often referred to as a universal language . When people speak of universals, however, it is important to recognize that often something thought of as universal is merely universal to those who share the same cultural and historical background. In this context, Secada (1983) and Norman (1988) demonstrated that algorithms and mathematical operations themselves are not universally the same because they may have different procedures in different cultures. According to Perkins and Flores (2002):

> Compared with the differences in language and culture faced by students who are recent immigrants, the differences in mathematical notation and procedures seem to be minor. Nevertheless, immigrant students confront noticeable differences between the way that mathematical ideas are represented in their countries of origin and the manner that they are represented in the United States .

The same point of view is shared by Secada (1983) who argues that immigrant students may come to school having learned different algorithms for the number operations than are commonly taught in the United States.

VII. MATHEMATICS AND CULTURE

Many students and teachers believe that mathematics is acultural, that it is a discipline without a cultural significance, and fail to see that the connection between mathematics and culture .Culture can interfere in the learning of mathematical concepts in the classrooms because mathematics has been created by a culture based upon their needs. Davidson (1990) found that the interaction of native culture and mathematical ideas can be mutually reinforced because the application of culturally sensitive mathematical activities can help students to see the relevance of mathematics in their culture and help teachers to use this connection to teach more mathematics. In fact, if mathematics is thought of as the development of structures and systems of ideas involving number, pattern, logic, and spatial configuration and then examines how mathematics arises and is used in different cultures, then it is possible to gain a much deeper understanding of mathematics.

VIII. ETHNOMATHEMATICS

Ethnomathematics is the study of mathematics which takes into consideration culture in which mathematics arises. The term ethnomathematics is used to express the relationship between culture and mathematics . It is a relatively recent field of studying mathematical representations from different cultural perspectives. Ethnomathematics is concerned with the connections that exist between the symbol, the representation, and the imagery used . Moreover, representations from an ethnomathematical perspective have a wide scope as different cultures have different types of representational systems, which would be useful in the teaching and learning of mathematics. The development of ethnomathematics has challenged the traditional concept of Euro-centered mono-representational systems of mathematics into that of a world-centered multi-representational system of mathematics. The ethnomathematical perspective studies the number system and symbols of different ethnic groups and the representational systems of different aspects of their cultures. The representational system of a culture depends upon the types of mathematical knowledge each culture has developed. Cultural artifacts such as language, myths, and literature help pinpoint the representational system of different cultures and civilizations.

Ethnomathematics has an important role in the teaching and learning of mathematics, as is particularly interested in context of the representational system. This can help students realize their full mathematics potential by acknowledging the importance of culture and the identity and how culture affects how students think and learn mathematics. Teachers learn to model and show students how to value diversity in the classroom, while learning to understand both the influence that culture has on mathematics and how this influence results in diverse ways in which mathematics is used and communicated.

Another way to think about ethnomathematics is to look at it from two vantage points:

1) Mathematics can be viewed as others' mathematical practice, that is, it can include what is commonly referred to as multicultural mathematics, where teachers draw from mathematical activities from many cultures. What is needed is a revision of the mathematics curriculum in which it is necessary to include diverse cultural groups such as women, working people, ethnic and racial groups whose contributions and place in history have been distorted, marginalized, or ignored completely by overemphasizing a Eurocentric mathematics .

2) Mathematics can be viewed as people's own mathematical practice, that is, when we think about ethnomathematics as our own mathematics practice, the pedagogical approach starts with teachers and students learning to think about how they use mathematics in everyday situations. One way to do this is to have students keep a log for a day, a week, or some other period of time of how they or others use mathematics. Teachers then take this information and use it as a base from which to create contexts for problem solving.

IX. ETHNOMATHEMATICS AND REPRESENTATIONS

The notion of representation in ethnomathematics is to regard the natural, non-standard, informal, subjective and non-canonical, and context-based representation of mathematical concepts. Goldin demonstrated that representational systems can be classified into three categories: external, shared or negotiated, and internal. The external representations are, for instance, mathematical symbols, signs, characters, and signals. Moreover, these types of representation deal with such representations shared between teachers and learners. Various forms of internal representation include verbal and syntactic, imagistic, formal notational, and affective. Broadly speaking, there are two types of representation that affect student's understanding of and solution to mathematics problems:

1) Instructional representations (definitions, examples and models) used by teachers to impart knowledge to students, and

2) Cognitive representations that are constructed by the students themselves as they try to make sense of a mathematical concept or attempt to find a solution to a problem . There are many representations in school mathematics which can help communicate, solve mathematical problems, and identify attitudes of learners towards mathematics.

X. MATHEMATICS AND SEMIOTICS

A semiotic perspective helps teachers understand how natural language, mathematics, and visual representations form a single unified system for meaning-making. Since there are different semiotics approaches it is important to discuss different points in which mathematical reflections can be enlightened by applying a certain type of semiotics. Peirce's theory of signs and his classification from the point of view of the object of the sign (representant) is helpful in understanding different ways to represent, for example, the long division algorithm. Peirce defined a sign as "anything which an individual so determined by something else, called its object, and so determines an effect upon a person, which effect the individual call its representant". In this view, educators use signs all of the time, to interact with students. According to Houser (1987), Peirce believed that signs are the matter, or the substance of the thought and said that "life itself is a train of thought", that is, life and signs are fundamentally related and unseparable for all humans. Teachers present their students with signs (representants) in hopes of helping them to understand information. Sometimes mathematical lessons revolve around coming to consensus and understanding of a meaning of a sign such as the symbol for a division algorithm. Often, mathematical lessons simply use representations to help relate other ideas or signs. Sometimes students do not see the sign or symbol or algorithm as teachers assumed they would. Peirce's classification of signs from the point of view of the subject is helpful in understanding these representations. Peirce classified the relation of a sign to its object in one of three ways: as an icon, index, or symbol (Houser, 1987). An icon has some quality that is shared with the object. An index has a cause and effect link and a symbol denotes its object by virtue of a habit, law, or convention. In this context, a symbol is an abstract representation of the object. The "American division" symbol can be interpreted as an icon. A drawn division symbol (representant) looks like the real division symbol used in public schools in the United States. By understanding Peirce's classification, it is recognizable that representations can be perceived in different ways by different students (Houser, 1987). What is an icon to teachers may be perceived as a symbol to students.

Realizing this has two potential effects to teachers. First, they must try to learn all symbols and icons (all signs) that students interpret differently and secondly use this knowledge as a path and method for their instruction. The interpretant related to this representant of the division symbol was different for students than for the teachers.Teachers (interpretant) use the division symbol to represent a division algorithm. Some students view the division symbol representing a square root.

XI. ALGORITHMS

Algorithmic strategies are the actions and the use of conventional and personal collective symbolic tools for the solution of a problem that can be solved through mathematical operations and representations. These actions require tools and instruments that permit and grant adequate execution. Symbolic tools offer the power and guarantee to solve a problem through mathematics. There are different kinds of symbolic tools in accordance to specific cultural groups. Algorithms are closely linked to mathematical, cultural practices, languages and symbolical representations. Algorithms are real objects created through an interaction of people, language, and culture. Algorithms can be considered as cognitive strategies that appear as the result of the synthesis of external and internal operations and of collective and individual operations whose purpose is to achieve specific goals. It is a distinguished form of solving problems guided by a set of concrete actions which are subordinated to the idea of an intentional and conscious objective. Practically, these actions are organized by a set of a particular and discreet tasks in interrelation for effective work. The strategies that cultural groups create to deal with everyday tasks develop from actions that are in intimate relation with the cultural environment. These strategies involve certain operations that use symbolic tools and representations. Algorithms frequently embody significant ideas, and understanding of these ideas is a source of mathematical power. The notion of an algorithm is a guaranteed method to solve a problem. This involves the following five aspects:

1. Presentation of the idea of an algorithm as a procedure guaranteed to solve a type of problem according to its cultural origin.
2. Experience with some culturally diverse algorithms.
3. The algorithms do not simply mean rule for doing arithmetic.
4. Cultural mathematics practices and procedures can be algorithmized.
5. There are different algorithms to accomplish the same task.

Some suggestive studies support the idea that extensive practice with mental computation helps develop strong number sense. Since the standard algorithms tend to be optimized for pencil-and paper computation and not for mental computation, practice in mental arithmetic will probably lead to alternative algorithms. In particular, in practical problems involving long division, estimation usually is a consideration. We suspect that different culturally based algorithms will be a beneficial research activity to investigate and classify these and incorporate the results into teachers' manuals so that teachers could be prepared to discuss cultural algorithms profitably as they arise.

XII. WORK WITH IMMIGRANT STUDENTS

Often immigrant or Limited English Proficient students (LEP) in SDAIE classes are considered “at risk”. The term "at-risk" is usually used to describe a student who is struggling in school because of various linguistic, social, economic, and psychological factors. This label is generally applied as a signal to educators that such students may need extra academic attention or psychological support. Richardson (1989) also defines "at-risk" students from her work with the interaction of home, school, and community environments. In her model, educators look at the personal and background factors students bring to the classroom, how these factors interact with classroom culture and practices, and how classroom practices impact the outside factors.

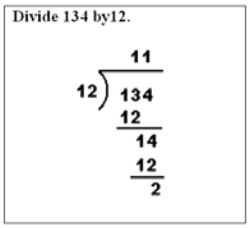
Immigrant students experience difficulties in learning mathematics that may have little to do with difficulties in processing mathematical ideas. Since immigrant students are from different cultures that may speak languages other than English as their primary language, and have differences in cognitive processing, the typical approach to organized mathematics instructions currently observed in American schools is not appropriate for their needs (Davidson, 1990). A problem that comes frequently to mathematics classrooms is related to students who may have difficulty in understanding the exact meaning of various symbols and representations. Since the student’s background knowledge and their entire repertoire of life experience determines the qualities of meanings derived from a mathematical problem, cultural difference often pose interesting challenges for both students and teachers alike. Similarly, the classroom culture set by the teacher influences how well students come to understand problems and how they conceptualize the very acts of interpreting and solving these problems.

XIII. THE LONG DIVISION ALGORITHM

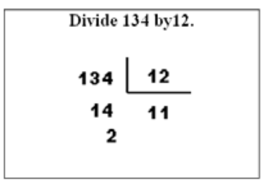
Symbols and representations can be seen as tools for conveying mathematical information. The problem, however, is to understand how immigrant students come to understand the meaning of symbols and representations that may not be part of their former reality. Immigrant students that attend schools in the United States have interesting mathematical experiences. One of these experiences is related to the long division algorithm; in this case, algorithm is defined as a rule or procedure for solving problem . The procedures that are taught in schools in the United States, sometimes, look so different from what was learned in schools in their home countries. Perkins and Flores (2002) state that:

As teachers encounter algorithms taught in other countries, they realize that the algorithms that they have learned are just some of the possible ways to compute answers. This realization can help teachers become more accepting when students deviate from the procedures or algorithms taught in class and use their procedures .

Schools in the United States, teach the following procedure for long division:



In Brazilian schools, for instance, students learn the following procedure for long division:



This manner of doing long division was also shared by students who learned it in Armenia, Iran, Pakistan, Russia, Ukraine, and Vietnam with some minor differences. In the case of the Brazilian division algorithm, the divisor is inside an L-shaped symbol. In the United States algorithm, the dividend is inside the symbol that looks like a denatured square root symbol. In fact, when some immigrant students see teachers writing that, they often assume they are computing a square root. Maybe, one curious effect of these arrangements is linguistic in nature. In Portuguese, division is always read it as "134 divided by 12[1]". In English, that is allowed, but "dividing 12 into 137", or simply "12 into 137", or 12 goes into 137" are more common ways of saying the same.

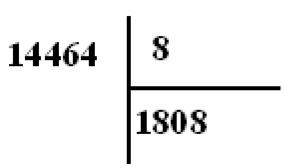
XIV. HISTORY OF DIVISION SYMBOLS

It is impossible to fix an exact date for the origin of the present arrangement of figures in the long division algorithm, partly because it developed gradually. According to Cajori (1993) it appears that the Babylonians had ideograms which, translated, are *Igi-Gal* to express denominator or division. They also had, ideograms which, translated, are *Igi-Dua* for division. Despite the Greek's fractional notation, they did not have a symbol for division (Cajori, 1993). It seems that the notation for division came under the same head as the notation for fractions. In the Hindu $Bakhsh\bar{a}l\bar{i}$ arithmetic division is marked by the abbreviation *bhâ* from *bhâga* which means part . The Hindus designated fractions by writing the denominator beneath the numerator. The horizontal fraction bar was introduced by the Arabs, who first copied the Hindu notation, but later improved on it by inserting a horizontal bar between the two numbers. Several sources attribute the horizontal fraction bar to the Arabic writer al-Hassâr around 1200. He mentions the use of the fractional line by writing the denominator below a horizontal line and over each of them the parts belonging to it. Italian mathematician, known as Fibonacci, in his book *Il Liber Abbaci,* written in 1202, uses the fractional line. He states that when above any number a line is drawn, and above that is written any other number, the superior number stands for the part or parts of the inferior number; the superior number is called numerator and the inferior number is called denominator. Fibonacci symbolised division in fraction form with the use of a horizontal bar, but it is thought likely that Fibonacci adopted al-Hassar's introduction of this symbolization. Fibonacci was the first European mathematician to use the fraction bar as it is used today. He followed the Arab practice of placing the fraction to the left of the integer. Cajori (1993) states that the earliest mathematician to suggest a special symbol for division other than a fractional line was Michael Stifel (1487-1567), a German mathematician and algebrist. He wrote *Arithmetica Integra,* in 1545, where he often employed one or two lunar signs to perform short and long division. For example, the meaning of the arrangement $8)24($ or $8)24$ is 24 divided by 8 . Stifel also used the German capital D to signify division, but he did not use Stifel's suggestion in arithmetic or algebraic computations . Simon Stevin (1548-1620) Flemish mathematician, in 1634, wrote *Euvres* in which he used the letter D to compute division problems. William Oughtred (1575-1660), English mathematician, in his book *Clavis Mathematicae*, written in 1631, emphasized the use of mathematical symbols such as division symbols. Oughtred wrote, in 1677, *Opuscula posthuma*, where he uses the symbols $\frac{4}{3}\Big)\frac{3}{2}\Big(\frac{9}{8}$ to mean $\frac{3}{2} \div \frac{4}{3} = \frac{9}{8}$. Joseph Moxon (1627-1691), wrote in 1679, the *Mathematical Dictionary* to explain mathematical terms and to show that $D)A+B-C$ means D. According to Cajori (1993), in the book *Treatise of Algebra* written in 1685 by John Wallis (1616-1703), English mathematician, he factored 5940 as $11)5)3)3)3)2)2)5940(2970(1485(495(165(55(11(1$. Gottfried Wilhelm von Leibniz (1646-1716), German philosopher and mathematician, stated in his article

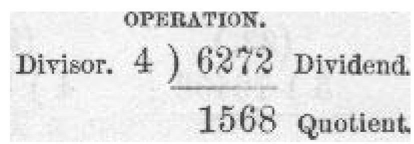
Miscellanea Berolinensia, in 1710, that the division was commonly marked by writing the divisor beneath its dividend, with a line of separation between them. In 1753, Gallimard used the inverted letter ᗡ for division, in his book *Methode d'arithmetique, d'a algebre et de geomètrie.* José Anastácio da Cunha (1744-1787), Portuguese mathematician, wrote in 1790, *Principios Mathematicos,* in which he used the horizontal letter ᗜ as a symbol for division. According to the Peruvian author, Juan de Dios Salazar, in his book *Lecciones de Aritmetica,* written in 1827, the division was indicated by writing the dividend and the divisor on the same line, but inclosing the former in a parenthesis such as $(20)5$ meaning $20 \div 5$. In relation to relative position of divisor and dividend, Cajori (1928) stated:

> In performing the operation of division, the divisor and the quotient have been assigned various positions relative to the dividend. When the "scratch method" of division was practiced, the divisor was placed beneath the dividend and moved one step to the right every time a new figure of the quotient was to be obtained. In such cases, the quotient was usually placed immediately to the right of the dividend, but sometimes, in early writers, it was placed above the dividend. In short division, the divisor was often placed to the left of the dividend, so that $a)b(c$ came to signify division (pp. 273).

In the same year of 1827, the long division method is found in the book A *Course of Mathematics* written by Charles Hutton where he stated that to divide a number by the whole divisor at once, after the manner of long division. In 1833, F. Gerard described, in his book *Arithmétique de Bézout,* the following algorithm do divide 14464 by 8:

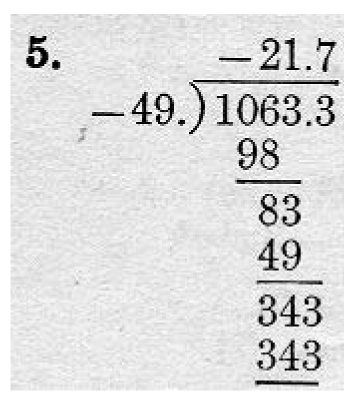


In 1837, James Thomson, stated in his book *Treatise on Arithmetic,* that the French people placed the divisor to the right of the dividend and the quotient below it. He also stated that they set up the division algorithm in a more compact and neat appearance. In his opinion, the French algorithm for division possessed the advantage of having the quotient near the divisor which allowed a fastest way to multiply the divisor by the dividend. The short division method is also found in the 1844 in *Introduction to the National Arithmetic on the Inductive System* written by Benjamin Greenleaf (1786-1864) that described a method of operation by using short division; however the divisor could not exceed 12. In 1857, in his book *Higher Arithmetic, or the Science and Application of Numbers, Combining the Analytic and Synthetic Modes of Instruction;* James B. Thomson stated that "the divisor is placed on the left of the dividend, and the quotient under it, merely for sake of convenience ". It is interesting to observe that Thomson stated on page 70 that the French place the divisor on the right of the dividend, and the quotient below it. The example given by the author showed that he valued different ways to solve problems. In the middle of the nineteenth century, some United States mathematics text books commonly showed long division with the divisor, dividend, and quotient on the same line, separated by parentheses, as 36)116(3. According to Miller (2004), this notation is used, for example, in 1866 in the book *Primary Elements of Algebra for Common Schools and Academies* written by Joseph Ray. This same notation for long division is used in 1882, in the book *Complete Graded Arithmetic* written by James B. Thomson. In the examples used for short division, a vinculum almost attached to the bottom of the close parenthesis is placed under the dividend and the quotient is written under the vinculum.



From ***Complete Graded Arithmetic*, 1882**
(source: http://members.aol.com/jeff570/operation.html)

Miller (2004) stated that in the teacher's edition of the book *Elements of Algebra* written by Joseph Ray in 1888, the algorithm for division is shown below.



From Elements of Algebra, 1888
(source: http://members.aol.com/jeff570/operation.html)

Miller (2004) also stated that Daniel W. Fish, in the second edition of his book *Robinson's Complete*

Arithmetic written in 1901, used the Thomson's notation for short and long division, except that he attached the vinculum under the dividend to the close parenthesis.

XV. FINAL CONSIDERATIONS

A comprehensive view of mathematics curriculum is implicit in an ethnomathematical and semiotics perspective. If we think of individuals possessing the potential for understanding and communication through a variety of mathematical signs and systems within cultural contexts, it is possible to gain new perspectives on human potential and on the organization of the mathematics curriculum. Mathematics can only be learned and taught if it includes culture, natural language, and visual representations that are culturally relevant to learners and teachers alike. An ethnomathematical and semiotic perspectives helps to understand and appreciate the cultural diversity, natural language, mathematics, and visual representations which form a unique system for meaning-making. In this context, reorienting teaching and learning to include ethnomathematics can engage and excite students about learning and encourages them to see themselves as mathematicians. Students' own cultural experiences are validated, and in fact serve as an essential component of classroom activities in the mathematics curriculum must be based on:

- Emphasize multicultural referents and relevancy in lessons (Krause, 1983).
- Use basic mathematics vocabulary in the second language for individualized instruction whenever possible. Note that the vocabulary should not be used to focus on key words but should be used in context to develop understanding (Freeman and Freeman, 1988).
- Be aware of how other countries and cultures teach basic mathematical concepts (Secada, 1983).
- Concerted efforts to be aware of and to explain any culturally-based terms (Freeman and Freeman, 1988).

It should be a goal for all students and teachers to come to understand why and how algorithms they use actually work. This understanding should be achieved as soon as ideally possible, at the time of introduction of algorithms. It is necessary to develop a theoretical framework, drawing on literature from semiotics and ethnomathematics, to address the ways in which real experiences and cultural practices of students are connected to the mathematics found in classroom pedagogy. There is a hope that students who use different algorithms could usually be brought to understand the relation between their method and the algorithm that they currently using. In this context, ethnomathematics helps reinforce available comparisons through the study of culturally diverse algorithms.

Participants in the *Algorithm Collection Project* (Orey, 2004), develop an awareness of the qualities of culturally-based algorithms, and are learn to appreciate algorithms as natural creations, indeed extensions or artifacts of diverse cultural groups used to produce mathematical knowledge. From a practical point of view, a sufficiently deep appreciation of the beauty, power, and sophistication of culturally diverse algorithms will bridge the gap between standardized algorithms as the ones used in their own cultures. The most important thing is that there are not uniform ways of solving problems. It is important to understand that in learning an algorithm you confront the essence of the phenomenon by which an algorithm comes to guarantee and accomplish its goals and objectives. What we have seen in our work is that if we see mathematics as a universal language, then there are various accents and dialects worthy of study.

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