



Third International Conference on Ethnomathematics: Cultural Connections and Mathematical Manipulations

Terceiro Congresso Internacional De Ethnomatemática:
Conexões Culturais e Manipulações Matemáticas

Troisième Conférence Internationale d'Ethnomathématiques:
Connexions Culturelles et Manipulations Mathématiques

Concurrent abstract sessions
(Alphabetical order of first author's name)

12 – 16 February 2006
Auckland, New Zealand

Note:

Most translations were not made by the author, our apologies for any errors or mistranslations. We would like to thanks Ana-Maria Liblik, Maria do Carmo Domite and Berlane Martins for translations into Portuguese, Nuria Gorgorió into Spanish and Caroline Poisard into French.

Mutual interrogation as an ethnomathematical approach

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Abstract:

The paper briefly discusses the well-known paradox in Ethnomathematics (Millroy, 1992) and links this to issues of colonization and decontextualization of cultural knowledge that are engendered by the ethnomathematical practice. It then proposes a shift of ethnomathematical perspective by expounding on the *window metaphor* and develops the concept of *mutual interrogation* as an approach in the search for alternative conceptions of quantity, relations, and space that are associated with cultural practice. The paper ends by presenting some examples from the author's research on the practice of rice terracing agriculture in the Cordillera region in northern Philippines.

Résumé :

L'interrogation mutuelle comme approche ethnomathématique

Cet article discute brièvement le paradoxe bien connu en ethnomathématiques (Millroy, 1992) et fait le lien avec les questions de colonisation et de décontextualisation du savoir culturel qui sont engendrées par la pratique ethnomathématique. Il propose ensuite un changement de perspectives ethnomathématiques en exposant la *métaphore de la fenêtre* et développe le concept *d'interrogation mutuelle* comme approche possible dans la recherche d'autres conceptions de quantité, relations et espace qui sont associées à une pratique culturelle. Cet article se termine par la présentation de quelques exemples de la recherche de l'auteur sur la pratique du terrassement pour l'agriculture du riz dans la région de la Cordillera dans le Nord des Philippines.

Values, tradition, and daily practice in math class: the cultural clash between new immigrant teachers from the FSU and Israeli teachers

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Abstract:

Why study math? Because it organizes the mind! This was Lena's answer. The quote from Lomonosov (1776) expresses the unequivocal view of Lena and her fellow immigrant math teachers from the FSU. This maxim, however, runs counter to the view of mathematics held by veteran math teachers in Israel who see their discipline as a vehicle for developing critical and creative thinking.

This dichotomy illustrates only the tip of the iceberg of two contrasting pedagogic cultures that met in the early 1990s, when Israel was inundated by a massive wave of immigration from the FSU, many of them math teachers. Based on the assumption that mathematics and math instruction are devoid of values and tradition, the new immigrants and Israeli authorities were certain that after basic language skills had been acquired the FSU teachers would smoothly and quickly assimilate into the state system. This assumption proved completely illusory.

Research, that was aimed to characterize the differences between math education in the FSU and Israel, showed that cultural and social values inevitably permeate the classroom and daily teaching practices. For example, the FSU teachers' highest admiration for hard work per se, was reflected in their preference for teaching massive algebraic manipulations rather than thought-inducing and investigative tasks. The FSU immigrants' authoritarian social outlook was expressed in their anti-constructivist instructional approach. The Soviet tradition of strict hierarchical supervision set their evaluation methods and teacher-pupil interaction, and so forth. The FSU-Israeli cultural encounter forced the assimilators to re-examine, re-evaluate, and modify their values. The research concludes with a model for the joint empowerment of assimilators and newcomers, without patronizing tendencies, through dialogue and mutual respect.

Resumo:

Valores, tradição, e prática cotidiana na sala de aula de Matemática: o choque cultural entre novos professores imigrantes de FSU e professores israelenses.

Por que estudar Matemática? Porque organiza a mente! Esta foi a resposta de Lena. A citação de Lomonosov (1776) expressa o olhar inequívoco de Lena e seu colega imigrante, professor de Matemática da Federação das Repúblicas Socialistas Soviéticas (FSU). Esta frase, contudo, entre em choque com a visão de Matemática que os professores veteranos em Israel têm, que vêem esta disciplina como um veículo para desenvolver o pensamento crítico e criativo.

Esta dicotomia ilustra somente a ponta de um iceberg de contrastes pedagógicos entre culturas que se encontraram no início dos anos 90, quando Israel foi invadida por uma massiva onda de imigração da FSU, e muitas destas pessoas eram professores de Matemática. Baseados na afirmativa de que Matemática e Ensino de Matemática são isentos de valores e tradição, os novos imigrantes e as autoridades de Israel tinham certeza de que após as habilidades básicas de linguagem tivessem sido adquiridas, os professores da FSU teriam suave e rapidamente se incorporado ao sistema do estado israelense. Esta afirmação provou ser completamente ilusória.

A pesquisa, que foi desenvolvida para caracterizar as diferenças entre a Educação Matemática na FSU e Israel, mostraram que os valores culturais e sociais dos diferentes grupos, inevitavelmente permeiam as classes e as práticas diárias dos professores. Por exemplo, a grande admiração dos professores da FSU pelo trabalho “duro” (hard work) *per se*, foi reflexo das suas preferências pelas repetitivas operações algébricas ao invés de desenvolver o pensamento indutivo e as habilidades investigativas dos alunos. O trabalho social dos professores da FSU foi expresso pelas aproximações instrucionais não-construtivistas. A tradição soviética de uma acirrada supervisão hierárquica organizou os métodos avaliativos e as interações entre professores e alunos, a assim por diante. O embate cultural entre Israel e FSU forçou os grupos a re-examinar, re-avaliar e modificar seus valores. A pesquisa conclui com um modelo para o fortalecimento dos grupos em serviço e para os possíveis professores vindouros, sem padronizar tendências, por meio do diálogo e de respeito mútuo.

Language and topology: notes from the field

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Abstract:

This will report on data from a major project that investigates the way in which research mathematicians understand the concepts in their field. The research question is whether researchers from different language backgrounds understand the defined concepts from their field in different ways because of the language in which they work.

Data from Chinese, Spanish, and Turkish participants will be discussed. There is increasing evidence that differences between researchers based on language groups do exist. Linking this to language as the cause is more difficult. Differences between researchers based on other socio-cultural factors have also emerged

Résumé:

Langage et topologie: réflexions sur le domaine

Cet atelier présentera les données d'un important projet qui étudie comment les mathématiciens comprennent les concepts de leur domaine. La question de recherche est de savoir si les chercheurs, issus de différentes langues maternelles, comprennent les concepts déjà définis de leur domaine de différentes manières selon la langue dans laquelle ils travaillent.

Les données recueillies auprès de mathématiciens chinois, espagnols et turcs seront discutées. L'hypothèse qui tend fortement à se vérifier est qu'il existe des différences entre chercheurs selon leur langue. Établir que ces différences proviennent de la langue est plus difficile. Des différences entre chercheurs concernant d'autres facteurs socio-culturels sont aussi apparues.

Ethno-mathematics, ethno-knowledge, and ethno-education

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Abstract:

My concern is curriculum and I interpret curriculum as *all planning for the classroom*. Curriculum therefore involves what is taught and how it is taught, learned, and assessed, and the planning occurs at regional, school, and classroom levels. When thinking about ethnomathematics and curriculum I see a need for consideration of the 'ethno' aspects of education and knowledge as well as of mathematics and with this paper I have tried to stimulate this process. For me such consideration implies involvement of and listening to the people from the various cultures, solutions cannot be imposed by outsiders.

My intention in presenting these issues is to raise questions not provide answers. The answers will vary across cultures and the people of each culture must make the decisions for their people. The role of mathematics educators is to provide opportunities for debate and decision making, to empower people of different cultures, to listen to the debates, and to provide professional legitimization if and when necessary so that mathematics education can move forward. However, there is a risk that mathematics educators may be too well indoctrinated in their own privileged academic culture and not hear what people really want.

Resumo:

Etno-matemática, etno-conhecimento e etno-educação

Meu interesse é currículo e eu interpreto currículo como tudo que é planejado para a sala de aula. Assim, currículo envolve o que é ensinado e como é ensinado, aprendido, avaliado e o planejamento ocorre em níveis regionais, escolares e da sala de aula. Ao pensar sobre a etnomatemática e o currículo eu vejo necessidade em considerar os aspectos 'etno' da instrução e do conhecimento assim como da matemática e eu tentei, com este artigo, estimular este processo. Para mim tal consideração implica a participação e a escuta de povos de várias culturas, as soluções não podem ser impostas por outros externos ao grupo.

Minha intenção em apresentar estas questões é levantar perguntas, não dar respostas. As respostas estarão variando pelas culturas e os povos de cada cultura devem tomar as decisões para seus grupos. O papel dos educadores matemáticos é fornecer oportunidades para o debate e as tomadas de decisão, dar mais poder aos povos das diferentes culturas, escutar os debates e dar legitimação profissional se e quando necessário, de modo que a educação matemática possa avançar. Entretanto, há o risco dos educadores matemáticos estarem demasiado doutrinados em sua própria cultura acadêmica privilegiada e não ouvir o que as pessoas realmente querem.

The connections between ethnomathematics and teacher education

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Abstract:

Speaking the history of teacher education, my preoccupation is: the lack of reference to the students - especially to the students' previous knowledge - in most researches carried out by those involved in teacher education. And, since ethnomathematics focuses on identifying quantitative and space relations in the "other" knowledge, on his/her own rationality and terms, the aim of my work in teacher education is to suggest a curriculum of teacher preparation that problematizes processes in which the student's knowledge becomes an integral part of teacher education - so that the teacher educators and the teachers can deepen their understanding of how this knowledge influences pedagogic practice.

Resumo:

Conexões entre etnomatemática e formação de professores

Ao considerar a história da formação de professores, minha preocupação pode ser assim explicitada: há uma falta de referência ao educando – em especial ao conhecimento prévio do educando - na maioria das pesquisas realizadas por aqueles envolvidos em formação de professores. E, uma vez que, a etnomatemática focaliza a identificação das relações quantitativas e espaciais do conhecimento do "outro", em sua própria racionalidade e termos, um dos alvos do trabalho apresentado está em sugerir um currículo de formação de professores que problematize processos nos quais o conhecimento do educando se torne parte integrante das discussões em torno da formação de professores (de matemática) - de modo que os formadores/formadoras e professores/professoras possam aprofundar sua compreensão de como tais conhecimentos influenciam a prática pedagógica.

Rural past marks in migrant young and adults mathematical knowledge

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Abstract:

This work aims to understand mathematical knowledge building processes of low literate young and adults originary from different Brazilian geographic contexts, by analysing their teachers' practice. Great part of these students carry marks from past rural experiences that can be noticed in the classroom daily activities. Migrant condition seems to have influenced their thinking and learning ways, as mathematical knowledge procedures clearly indicate signs of non-formal and rural apprenticeships. Survival strategies and tactics constructed by adult students during their agricultural past reflect on their present mathematical reasoning. Back to school after some years of absence, migrant adults experienced a double denial of their identity, for not having their specific knowledges and their particular ways of understanding reality accepted by this institution. Our study try to analyse these knowledges building processes, contributing to adult education teacher training by focusing in classroom dialogic interactions between different forms of thinking mathematically. We have worked with data collected from the authors' former investigations, they articulated the analysis of non-formal apprenticeship processes in the rural areas with an ethnomathematical study developed with a group of young and adult students living in a poor neighbourhood of Rio de Janeiro. We worked as well with preliminary data, collected from interviews and observations of classroom routines, from a qualitative research being done with Mathematics teachers that work in adult basic education in Rio de Janeiro.

Resumo:

Marcas do passado agrícola em saberes matemáticos de jovens e adultos migrantes
O trabalho busca compreender os processos de construção de saberes de jovens e adultos, oriundos de diferentes contextos geo-político-econômicos brasileiros, a partir da prática docente de seus professores. Parcela significativa desses alunos traz marcas de seu passado rural, que se manifestam nas práticas cotidianas das salas de aula. A condição de migrante repercute nos seus modos de pensar e aprender. Quanto aos saberes matemáticos, aparecem indícios de procedimentos que revelam claramente as aprendizagens não formais do campo. Estratégias e táticas de sobrevivência, construídas no passado agrícola dos educandos de Educação de Jovens e Adultos (EJA), têm reflexos nas formas atuais de raciocinar matematicamente. Na escola, adultos migrantes vivem uma dupla negação, ao serem recusados em razão de seus saberes e de suas formas de compreender a realidade. Procura-se analisar por quais processos são construídos esses saberes, trazendo para a formação de professores de EJA elementos para a construção, na sala de aula, de espaços de diálogo entre saberes matemáticos diferenciados. Neste trabalho damos seguimento às pesquisas anteriores das autoras que articulam a análise de processos de aprendizagens não-formais no campo com estudo etnomatemático realizado junto a grupo de jovens e adultos de

uma favela carioca, assim como os resultados preliminares de uma pesquisa qualitativa que vem sendo feita junto a professores de Matemática de jovens e adultos do município do Rio de Janeiro, em que estão sendo utilizadas entrevistas semi-estruturadas e observações de sala de aula.

Teaching mathematics to young and adults: ethnomathematics and teachers continuous education in Rio de Janeiro

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Abstract:

This work reflects about the collective building process of the document that will be part of Rio de Janeiro municipal district basic nucleo-curriculum (*MULTIEDUCAÇÃO*), destined to Mathematics teachers involved with adult education, that had ethnomathematics as its theoretical and methodological background. This document aimed to establish a dialog with Mathematics teachers about the specificity of teaching young and adults of the working class. The document composition process, coordinated by both authors, was achieved in five fundamental stages: 1. raising questions to be approached in text; 2. studying mathematics education conceptions, approaches, tendencies and perspectives; 3. grouping questions previously raised in themes and teachers distribution in small groups to start initial writing; 4. reading, critical analyzing, correction and deepening of writings aiming to compose one articulated final text; 5. text evaluating by school teachers and by academic specialists, with resulting feed-back to the group for necessary modifications. We have worked as a collaborative group for the collective writing process, by establishing a democratic and dialogical environment among participants' speeches, relating teachers' theories and daily experiences. During writing process the teachers identified ethnomathematics as an appropriate and mandatory path, because of the great cultural diversity of adult education classrooms. They agreed about the importance of validating these students mathematical knowledge, and ethnomathematics seemed to be an important tool for their empowerment and to lessen the social exclusion these students experience.

Resumo:

A etnomatemática na formação continuada de professores de matemática da educação de jovens e adultos do município do rio de janeiro

O presente trabalho refere-se a uma reflexão sobre o processo de construção coletiva do texto que será integrado ao Núcleo Curricular Básico MULTIEDUCAÇÃO, para professores de Matemática de Educação de Jovens e Adultos (EJA) no Município do Rio de Janeiro, que teve a etnomatemática como referencial teórico e metodológico. O referido documento teve como objetivo proporcionar um diálogo com professores acerca da especificidade do trabalho em Educação Matemática para a modalidade de EJA. O processo de construção do material, coordenado pelos autores, foi realizado em 5 etapas: (1^a) levantamento das questões que deveriam ser abordadas no texto; (2^a) estudo das concepções, abordagens e tendências do ensino da Matemática e suas perspectivas (3^a) agrupamento das questões levantadas em temas e distribuição dos professores em grupos para redação dos textos iniciais; (4^a) leitura, análise crítica, correção e aprofundamento dos textos visando a organização de um texto único e articulado; (5^a) avaliação do texto resultante por professores da rede e por

especialistas do meio acadêmico, com o retorno ao grupo para as devidas modificações. A metodologia adotada para o trabalho de construção coletiva do texto foi a de grupo colaborativo, estabelecendo um diálogo democrático entre os discursos dos participantes, na relação entre teorias e experiências vividas e relatadas pelos professores. Durante esse processo os professores identificaram a etnomatemática como um caminho necessário e adequado, devido à situação de exclusão social dos educandos jovens e adultos e à grande diversidade cultural presente nas salas de aula, buscando a valorização dos saberes matemáticos desse grupo.

Nursing mathematics: what skills do nursing students bring to drug calculations?

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Abstract:

The ability to accurately and confidently calculate medication dosages for administration to patients is an essential skill for all nurses as errors can lead to injurious or fatal consequences. The literature abounds with evidence of errors and deficiencies in the calculation skills of nursing students and registered nurses, as well as the difficulties they experience when performing calculations including inability to conceptualise the problem and 'set up' the calculation. The study investigates the performance, prior to any drug calculation instruction, of 35 first-year nursing students on ten calculation problems similar to the dosage problems encountered in clinical practice. The 'native' methods used by students were examined, as was their ability to apply to correct method. The findings indicate that many beginning nursing students are well equipped for dosage calculation with a range of successful problem-solving strategies but are sometimes unable to obtain the correct answer because of inadequacies in their computational skills. That some students are able to apply appropriate methods to solve even the most difficult of drug calculation tasks – those involving intravenous medications – before receiving drug calculation instruction highlights the need to reassess the formula-based methods traditionally used to teach drug calculation.

Resumen:

Cuidando de las matemáticas: ¿Qué competencias aportan los estudiantes de enfermería al cálculo de medicaciones?

La habilidad para calcular con seguridad y de forma precisa las dosis de medicamentos que deben ser administradas a los pacientes es una competencia esencial para todas las enfermeras dado que cualquier error puede ser perjudicial e incluso conducir a resultados fatales. Son abundantes las publicaciones que aportan evidencias de errores y deficiencias en las habilidades de cálculo del personal de enfermería, tanto en formación como en activo. Son conocidas también las dificultades que tienen al hacer los cálculos, dificultades que incluyen la falta de capacidad para conceptualizar los problemas y plantear los cálculos. El estudio investiga el comportamiento de 35 estudiantes de enfermería de primer año, antes de que recibieran ninguna formación relativa al cálculo de medicaciones, en la resolución de diez problemas de cálculo de dosis similares a los que pueden encontrarse en la práctica clínica. Se estudiaron los métodos 'nativos' utilizados por los estudiantes y también su habilidad para aplicar el método correcto. Los resultados indican que muchas de las estudiantes de enfermería están bien preparadas para el cálculo de dosis con una variedad notable de estrategias de resolución de problemas. Sin embargo, a veces son incapaces de obtener la respuesta correcta debido a inadecuadas habilidades de cálculo. El hecho que algunos alumnos sean capaces de aplicar métodos correctos para resolver incluso las tareas más difíciles de cálculo de medicamentos –aquellos referidos a medicación intravenosa– antes de recibir instrucción relativa al tema pone de manifiesto la necesidad de evaluar de nuevo los métodos basados en fórmulas que tradicionalmente se utilizan para enseñar cálculo de medicaciones.

Beauty, the human, and mathematics: elements of a case for Homo Maestheticus

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Abstract:

Attempts at characterizing 'human nature' have been a constant and contentious component of the intellectual repertoires of many cultural groups for a very long time (recall the tribulations of Prof Plato when confronted with Diogenes's plucked rooster - 'featherless biped' indeed). Part of the problem historically has been a 'winner take all' attitude on the part of many of the proponents of *faber, divinitas, politicus, observans, laborans* etc. One of the striking contributions of scholarship in ethnomathematics in the past three decades has been the generation of an extensive and diverse corpus of work that speaks clearly and compellingly of the depth, power and sophistication of mathematical ideas developed in a broad range of social, cultural and geographical settings. Building on this material, and findings in other academic disciplines such as biology, this paper will argue for the claim that the human animal is, in many closely related ways, predisposed toward both the aesthetic and the mathematical. This conception of one aspect of a multifaceted species will, acknowledging the important work of the American scholar, Ellen Dissanayake [*Homo Aestheticus*, University of Washington Press, 1995] be noted as *homo maestheticus*. The paper will end with some considerations, particularly in the sphere of education, of the implications of this view.

Resumen:

Belleza, lo humano y matemáticas: elementos de un caso a favor del Homo Maestheticus

Durante largo tiempo, los intentos por caracterizar la 'naturaleza humana' han sido una componente, constante y controvertida, de los repertorios intelectuales de muchos grupos culturales (recuérdense las tribulaciones de Platón al enfrentarse con el gallo desplumado de Diógenes –ciertamente un bípedo sin plumas). Históricamente, parte del problema radica en una actitud del tipo 'el ganador se queda con todo' por parte de muchos de los defensores de *faber, divinitas, politicus, observans, laborans* etc. Una de las contribuciones académicas atractivas en etnomatemáticas en las tres últimas décadas ha sido la génesis de un cuerpo extensivo y diverso de trabajos que manifiesta clara y convincentemente la profundidad, el poder y la sofisticación de ideas matemáticas desarrolladas en un amplio rango de escenarios sociales, culturales y geográficos. A partir de este material y de resultados de otras disciplinas académicas como la biología este artículo presenta argumentos para establecer que el animal humano está predispuesto, de múltiples formas estrechamente relacionadas, tanto para lo estético como para lo matemático. Nos referimos a esta concepción de un aspecto de una especie multifacética como *homo maestheticus*, en reconocimiento al importante trabajo de la académica estadounidense Ellen Dissanayake [*Homo Aestheticus*, University of Washington Press, 1995]. El artículo termina con algunas consideraciones relativas a las implicaciones de esta perspectiva, especialmente en la esfera de la educación.

Evolution of a dream: the emergence of Mayan ethnomathematics and indigenous ways of knowing at a Mayan autonomous school in Chiapas, Mexico

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Abstract:

My four year collaborative teaching and ethnographic study took place at a Mayan autonomous secondary school in the Highlands of Chiapas, Mexico from July 2000 to July 2003. Over that time, a process of mutual conscientization and intercultural dialogue allowed a Mayan ethnomathematics perspective to emerge in a manner consistent with indigenous ways of knowing. My presentation will offer illustrative evidence of how and why Mayan ethnomathematics developed at an autonomous school that itself was the product of a resistance movement and a dream for a dignified future for Mayan youth. Within this unique set of historical, social and political circumstances, a collaborative teaching project was initiated whose focus was Mayan ethno-mathematics as ancient practices, contemporary approaches to solving problems, and artistic expressions as part of daily life in Highland Mayan communities of Chiapas.

Resumen:

La evolución de un sueño: la emergencia de etnomatemáticas mayas y formas indígenas de saber en una escuela autónoma maya en Chiapas, México

Mi investigación etnográfica y colaboración de enseñanza durante cuatro años sucedió en una escuela autónoma secundaria Maya en los Altos de Chiapas, México desde julio de 2000 hasta julio de 2003. Durante ese tiempo, tuvimos un proceso de conscientización mutuo y diálogo intercultural que permitió la emergencia de etnomatemáticas mayas en una manera compatible con formas indígenas de saber. Mi presentación propondrá evidencia ilustrativa de cómo y porqué tuvimos una evolución de etnomatemáticas mayas en medio de una escuela que ella misma era producto de un movimiento de resistencia y un sueño para un futuro digno de los jóvenes Mayas. Dentro de este contexto único de circunstancias históricas, sociales y políticas, tomamos la iniciativa de hacer una colaboración de enseñanza para enfocar en el tema de etnomatemáticas mayas como prácticas antiguas, maneras de resolver problemas contemporáneos, y expresiones artísticas como parte de la vida cotidiana en las comunidades Mayas de Los Altos de Chiapas.

Ethnomathematics and education: some thoughts on the allegation of recent developments and current directions

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Abstract:

In 1996, Barton wrote: 'Very little of the ethnomathematical literature is explicit about its philosophical stance', which he considers to be 'one of the areas' that 'must be addressed if the subject is to gain wider legitimacy in mathematical circles'. In 2003, Barton, Adam and Alangui took issue with a recent, critical investigation of ethnomathematics, especially of its relationship with academic mathematics regarding teaching and learning. They dismiss the largely philosophical questions raised by Rowlands and Carson by suggesting that 'the role of ethnomathematics in mathematics education is now predominantly an empirical matter'.

What has happened in the interim that has contributed to this alleged shift? Is it true, now that the political and philosophical questions have been taken care of, that ethnomathematics is used successfully 'as a framework in the teaching of mathematics'? This view appears to rely for its plausibility partly on the work discussed in the two International Congresses on Ethnomathematics, and partly on the 'promise' of studies in indigenous knowledge. The underlying idea is that a philosophical, conceptual inquiry regarding ethnomathematics is now *passé* – and that any critique must address the empirical issues around curricular reliance on ethnomathematics and evaluate the results.

In this paper, I argue that any dismissal of philosophical engagement with the plausibility and viability of *ethnomathematics* on the grounds alluded to above smacks of mere verbal legislation. Furthermore, I will illustrate, through an analysis and critique of recent perspectives, that the philosophical debate around ethnomathematics is both alive and warranted – indeed, crucial.

Übersicht:

Ethnomathematik und erziehung: gedanken zu den angeblich neuen entwicklungen und gegenwärtigen richtungen

Barton schrieb 1996, dass es bislang nur in einem geringen Teil der Literatur zur Ethnomathematik eine philosophische Stellungnahme zum Thema gäbe. Dieses sei nachzuholen, wenn das Fach in mathematischen Kreisen je an Legitimität und Ansehen gewinnen solle. 2003 griffen Barton, Adam und Alangui einen eben veröffentlichten kritischen Beitrag an, der sich besonders mit der Beziehung zwischen der Ethnomathematik und der herkömmlichen Mathematik beschäftigte, und zwar im Hinblick auf Lehren und Lernen. Sie taten Rowlands und Carsons weitgehend philosophische Fragen als irrelevant ab, mit der Begründung, die Rolle der Ethnomathematik im Erziehungswesen sei mittlerweile eine überwiegend empirische Angelegenheit. Was war in der Zwischenzeit geschehen, das diesen Perspektivwechsel erklären könnte? Stimmt es, dass nun – da die politischen und philosophischen Fragen (angeblich) beantwortet sind – die Ethnomathematik als erfolgreiches Rahmenwerk für den Mathematikunterricht nutzbar ist? Diese Ansicht scheint sich teils auf die Arbeit zu stützen, die während der ersten beiden internationalen Ethnomathematikerkongresse vorgestellt wurde, teils auch auf die 'vielversprechenden' Studien 'eingeborenen' Wissens. Philosophische, begriffliche

Forschung wird somit unterschwellig als *passé* gekennzeichnet. Jegliche Kritik habe sich an den empirischen Fragen und Themen um die Einbindung der Ethnomathematik ins Lehr- und Schulwesen zu orientieren und die Resultate auszuwerten. In diesem Vortrag zeige ich auf, dass die Ablehnung der philosophischen Beschäftigung mit der Plausibilität und Lebensfähigkeit der *Ethnomathematik* anhand obengenannter Überlegungen wenig mehr als ein verbales Urteil ist. Außerdem veranschauliche ich anhand einer kritischen Analyse der jüngsten Perspektiven, dass eine philosophische Hinterfragung der Ethnomathematik nicht nur gerechtfertigt ist, sondern in der Tat wichtig und es auch zukünftig sein wird.

Resumo:

Etnomatemática e educação: algumas reflexões acerca de supostos recentes desenvolvimentos e direcionamentos atuais

Em 1996, Barton escreveu: 'Muito pouco da literatura em etnomatemática é explícita sobre sua postura filosófica', que considera ser 'uma das áreas' que 'deve ser abordada se é que há interesse que este assunto ganhe uma maior legitimidade em círculos matemáticos'. Em 2003, Barton, Adam e Alangui questionaram uma recente investigação crítica da etnomatemática, especialmente de sua relação com a matemática acadêmica, no que se refere ao ensino e a aprendizagem. Eles descartaram as perguntas levantadas por Rowlands e Carson, em grande parte de ordem filosófica, as quais sugeriam que 'o papel da etnomatemática na educação matemática é agora predominantemente um problema empírico'.

O que pode ter acontecido neste ínterim para contribuir para essa suposta mudança? É verdade que, hoje, as questões políticas e filosóficas tenham sido resolvidas, que a etnomatemática esteja sendo usada com sucesso 'como um modelo estrutural para o ensino da matemática'? Este ponto de vista parece depender, em parte, para sua plausibilidade no trabalho discutido nos dois Congressos Internacionais em Etnomatemática e, de algum modo, na 'promessa' dos estudos sobre conhecimento indígena. A idéia subjacente é que um inquérito filosófico e conceitual a respeito da etnomatemática é agora fora de moda - e que qualquer crítica deve tratar as questões empíricas em torno da dependência curricular na etnomatemática e avaliar os resultados. Neste trabalho, eu argumento que qualquer repúdio do compromisso filosófico com a plausibilidade e a viabilidade da *etnomatemática*, com base no que foi aludido acima, sugere mera legislação verbal. Além disso, eu ilustrarei, por meio de uma análise e de uma crítica a perspectivas recente, que o debate filosófico em torno da etnomatemática é vivo e justificado - de fato, crucial.

Does 'African' mathematics facilitate access to mathematics? Towards an ongoing critical analysis of ethnomathematics in a South African context

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Abstract:

Mosibudi Mangena, the Minister of Science and Technology, said in an address to the Annual Congress of the South African Mathematical Society at the University of the Potchefstroom, 2 November 2004: 'There is one thing we need to address before anything else. We need to increase the number of young people, particularly blacks and women, who are able to successfully complete the first course in Mathematics at our universities.' How is this to be achieved? A popular trend involves a call for the introduction and incorporation of so-called ethnomathematics, and more particularly 'African mathematics', into secondary and tertiary curricula. Although acknowledging the obvious benefits of so-called ethnomathematics, this paper critically analyses three aspects of ethnomathematics that have been neglected in past critiques. Our focus is not on the *relationship* as such between ethnomathematics and mathematics education. Our critique involves (1) epistemological and logical misgivings, (2) a new look at practices and skills, (3) concerns about embracing 'African' mathematics as valid and valuable – *just because it is African*. The first concern is about problems relating to the relativism and appeals to cultural specificity that characterize ethnomathematics, regarding mathematical knowledge and truth. The second set of considerations concern the idea that not all mathematical practices and skills are culturally or socially embedded. With regard to the validity and viability of 'African' mathematics, our misgivings not only concern the superficial sense of 'belonging' embodied in the idea of a uniquely and distinctly African mathematics, and the threat of further or continuing marginalization and derogation, but the implicitly (self-)demeaning nature of this approach. This paper serves as a reminder that a critical position in the deliberations of ethnomathematics needs to be sustained. It warns against the bandwagon syndrome in a society where the notion of political correctness has become a prominent imperative. This paper is framed by many unanswered questions in an attempt to inspire and sustain a critical discourse in the ethnomathematics movement.

Resumo:

A Matemática "africana" facilita o acesso à Matemática? Em direção a uma análise crítica da Etnomatemática no contexto da África do Sul.

Mosibudi Mangena, o Ministro de Ciência e Tecnologia, disse no Congresso Anual da Sociedade de Matemática da África do Sul, na Universidade de Potchefstroom, em 02 de novembro de 2004: "Há algo que é necessário fazer antes de tudo. Precisamos aumentar o número de jovens, especialmente negros e mulheres, que são capazes de completar com sucesso o primeiro curso de Matemática em nossas universidades". Como é que isso pode ser conseguido? Uma tendência popular conduz a introdução e incorporação da chamada Etnomatemática, e mais especificamente da Matemática

“africana”, nos currículos de Segundo e Terceiro graus de ensino. Embora sabendo os benefícios óbvios da tal chamada Etnomatemática, este texto analisa criticamente três de seus aspectos que têm sido negligenciados em críticas passadas. Nosso foco não é na *relação* entre Etnomatemática e Educação Matemática. Nossa crítica envolve (1) receios epistemológicos e lógicos, (2) um novo olhar para práticas e habilidades, (3) abraçar a Matemática “africana” como válida e preciosa – *apenas porque é Africana*. A primeira questão é com problemas sobre relativismo e chamadas para as especificidades culturais que caracterizam a Etnomatemática, considerando conhecimento matemático e verdade. O segundo grupo de considerações refere-se a idéia que nem todas as práticas e habilidades matemáticas são socialmente e culturalmente construídas. A respeito da validade e preciosidade da Matemática “africana”, nosso receio não apenas refere-se ao senso superficial de “pertença” embutida na idéia de uma diferente e única Matemática “africana”, e o prosseguimento de sua continua marginalização e depreciação, mas implica no (próprio) rebaixamento natural desta aproximação. Este texto serve como lembrete de que uma posição de crítica nas deliberações da Etnomatemática precisa ser bem sustentada. Ele previne contra a síndrome de propaganda em uma sociedade onde a noção de politicamente correto tem se tornado proeminentemente imperativa. Este trabalho está marcado por muitas perguntas sem resposta na tentativa de inspirar e sustentar um discurso crítico no movimento etnomatemático.

Übersicht:

Erleichtert ‘afrikanische’ mathematik den zugang zur mathematik? Ein plädoyer für andauernde kritische analyse der ethnomathematik im südafrikanischen kontext

Anlässlich des alljährlichen Kongresses des Südafrikanischen Mathematik-Verbandes an der Universität Potchefstroom verkündete Südafrikas Minister für Wissenschaft und Technologie Mosibudi Mangena in seiner Ansprache: ‘Es gibt ein Ziel, dem wir uns vordringlich zu widmen haben. Es gilt, jungen Menschen – insbesondere Schwarzen und Frauen – den erfolgreichen Abschluss eines Grundkurses in Mathematik an unseren Universitäten zu ermöglichen.’ Wie kann dies bewerkstelligt werden? Der allgemeine Trend geht dahin, die Einführung und Verankerung der sogenannten Ethnomathematik, besonders der ‘afrikanischen’ Mathematik, in schulische Lehrpläne und Curricula der Universitäten zu fordern. Obwohl wir die offenkundigen Vorteile der sogenannten Ethnomathematik zu würdigen wissen, thematisieren und diskutieren wir im Folgenden drei Gesichtspunkte, die in vorliegenden Analysen weitgehend unbeachtet geblieben sind. Im Kern geht es uns dabei nicht um das eigentliche *Verhältnis* zwischen Ethnomathematik und Mathematikunterricht. Vielmehr beruht unsere Problematisierung des Begriffs der Ethnomathematik auf (1) erkenntnistheoretischen und logischen Zweifeln, (2) einem neuen Blick auf praktische Fähig- und Fertigkeiten und (3) der Skepsis oder dem Verdacht, dass afrikanische Mathematik lediglich aus Gründen der political correctness als gültig und wertvoll erachtet wird. Im ersten Teil geht es um das Problem des Relativismus und das der kulturspezifischen Sichtweise, in Bezug auf mathematisches Wissen und Wahrheit, die der Begriff der Ethnomathematik aufwirft. Im zweiten Teil untersuchen wir die Behauptung, alle praktisch-mathematischen Fähigkeiten seien kulturell oder sozial bedingt. Was die Gültigkeit und Lebensfähigkeit der ‘afrikanischen’ Mathematik anbelangt, so richten sich unsere Zweifel nicht nur gegen jenes oberflächliche Zugehörigkeitsgefühl, das der Begriff einer einzigartigen und selbständig ‘afrikanischen’ Mathematik suggeriert. Wir warnen auch vor weiterer Marginalisierung, Herabwürdigung und vor der dadurch

betriebebenen, impliziten Selbstbeschränkung dieses Ansatzes. Nicht zuletzt möchten wir mit diesem Beitrag auf die Notwendigkeit kritischer Positionen gegenüber der Ethnomathematik hinweisen. Nur so ist zu gewährleisten, dass die Debatte um den umstrittenen Begriff nachhaltig geführt wird. Es soll ein Zeichen gesetzt werden gegen wissenschaftlichen Opportunismus und gegen die Haltung der political correctness, die vielfach als prominenter Imperativ gilt. Eine Vielzahl unbeantworteter Fragen werden aufgegriffen, um den kritischen Diskurs in der Ethnomathematikbewegung zu inspirieren und weiterzuführen.

Articulating oral mathematics and the use of a calculator in a peasant culture

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Abstract:

This paper presents and discusses one of the stages of a two-year study carried out in a teacher-training course for adult education organized by the Brazilian Landless Movement. The main purpose of the paper is to examine how the peasant pre-service teachers experienced a pedagogical practice, which implemented the articulations between oral mathematics and the use of a calculator. Taking as a theoretical framework the ethnomathematics field with the centrality it gives to cultural differences, the study aims to go further in a discussion previously held about mathematics education concerning this theme (Knijnik, 2003, 2004). The paper is organized in five sections. Following this introduction, the second section presents the theoretical framework which gives support to the paper. The main issues that characterize ethnomathematics are described and the meanings given to notions such as culture are discussed. The third section discusses methodological procedures of the study. The convergences between the methodological perspective and the theoretical framework are highlighted. The fourth section analyses a pedagogical process involving the articulation of oral mathematics practices with the use of the calculator. It focuses on how the students gave meaning to that experience and how cultural differences operated in that setting. The paper ends with remarks on some of the curriculum implications of the study for adult mathematics education in rural areas.

Resumo:

Articulando práticas da matemática oral e o uso da calculadora na cultura camponesa

O trabalho apresenta e discute um dos estágios de um estudo desenvolvido ao longo de 2 anos em um curso de formação professores de Educação de Jovens e Adultos organizado pelo Movimento Sem Terra do Brasil. O principal propósito do trabalho é examinar como os educandos que realizavam o curso experienciaram uma prática pedagógica que implementou a articulação entre a matemática oral e o uso da calculadora. Tomando como referencial teórico o campo da etnomatemática com a centralidade que o mesmo dá às diferenças culturais, o estudo buscou aprofundar a discussão antes realizada em torno do tema (Knijnik, 2003, 2004). O texto está organizado em cinco seções. Após a introdução, a seção seguinte apresenta o referencial teórico que deu sustentação à pesquisa. As principais questões que caracterizam a Etnomatemática são descritas e os significados dados a noções como as de cultura são discutidas. A terceira seção discute os procedimentos metodológicos do estudo. É destacado, ainda, a convergência entre a perspectiva metodológica e o

referencial teórico da investigação. A quarta seção discute um processo pedagógico envolvendo a articulação entre práticas de matemática oral e o uso da calculadora, tendo como foco de análise o modo como os estudantes deram sentido àquela experiência e como as diferenças culturais operaram naquele contexto. O trabalho finaliza com considerações sobre as implicações curriculares do estudo para a educação de jovens e adultos de áreas rurais.

Mathematics in a cultural Context: salmon fishing - investigations into probability

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Abstract:

Math in a Cultural Context (MCC) is a long-term project committed to developing elementary school math modules based on Yup'ik elders' knowledge. Part of the project's commitment is to develop culturally based curriculum which is mathematically challenging. This paper describes the process of developing *The Salmon Fishing: Investigations into Probability*. Further, the paper reports preliminary outcome data which suggests that this module was effective.

Resumo:

Matemática em um contexto cultural: a pesca do salmão – das investigações para a probabilidade

Matemática em um Contexto Cultural (MCC) é um projeto de longo termo criado para desenvolver módulos de Matemática para a escola primária baseados na sabedoria dos anciãos Yup'ik (habitantes do Alasca). Parte do compromisso do projeto é o de desenvolver um currículo culturalmente/localmente organizado que seria matematicamente desafiador. Este texto descreve o processo de desenvolvimento da pesca do salmão: das investigações para a probabilidade. Mais adiante, o documento apresenta dados que sugerem que este módulo escolar foi eficaz.

The role of language in ethnomathematics

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Abstract:

Drawing on experiences from Māori immersion schools in New Zealand, this paper examines the impact of language when ethnomathematical practices are discussed. The inclusion of ethnomathematical perspectives into the mathematics education of indigenous students is often described as being beneficial because students would feel: that their backgrounds and experiences were valued in the classroom; that mathematics can be developed by others outside of Western culture; and that mathematics has relevance to their lives outside the classroom (see Gutstein, Lipman, Hernandez & de los Reyes, 1997; Howard, 1995; Joseph, 1993). However, little research has been done to investigate these claims in Māori medium contexts.

Additionally we discuss how the language which is used to discuss ethnomathematics practices could benefit students. This paper will argue that cultural practices including ethnomathematical ones cannot be separated from the language in which they were developed. Changing the language or the linguistic register in which the practices are discussed will have an impact on how the practices are perceived by students. Without proper consideration of this issue, many of the benefits aligned with using these practices may be nullified.

Résumé :

Le rôle du langage en ethnomathématiques

Tiré d'expériences d'écoles néo-zélandaises où la seule langue parlée est le Maori, cet article examine l'impact de la langue lorsque l'on étudie les pratiques ethnomathématiques. La prise en compte de perspectives ethnomathématiques pour l'enseignement des mathématiques, concernant les élèves autochtones, est souvent décrite comme étant bénéfique. Les élèves sentiraient que leurs origines et expériences sont évaluées en classe, que les mathématiques peuvent être développées par d'autres, en dehors de la culture occidentale, et que les mathématiques sont pertinentes pour leurs vies en dehors de la classe (voir Gutstein, Lipman, Hernandez & de los Reyes, 1997; Howard, 1995; Joseph, 1993). Cependant, peu de recherches ont été faites pour mettre ceci à l'épreuve dans des contextes de langue maorie.

De plus, nous discutons comment le langage utilisé pour étudier les pratiques ethnomathématiques pourrait profiter aux élèves. Cet article affirme que les pratiques culturelles, dont celles qui sont ethnomathématiques, ne peuvent pas être séparées de la langue dans laquelle elles ont été produites. Changer de langue ou de registre linguistique, dans lesquels les pratiques sont étudiées, aura un impact sur comment ces pratiques sont perçues par les élèves. Sans considérations appropriées sur cette

question, beaucoup des bénéfices perçus par l'utilisation de ces pratiques peuvent être annulées.

Mathematical knowledge and its use in daily activities of workers at South African cultural villages

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Abstract:

Cultural villages have been part of the cultural landscape of South Africa over many years. Before the birth of democracy in 1994, they predominantly served the purpose of showing the divide between the different cultural groups and in a sense helped to perpetuate the stereotypes and magnify the differences between the different groups. Since 1994 this focus has changed. Attempts have been made to showcase the cultural diversity and the richness that populates the country. Alongside this change in focus has been the challenge to use outside classroom experiences to influence and have a bearing on classroom learning of various areas. One of the learning areas that has faced a major challenge to transform itself and how it is taught is mathematics. Ethnomathematical activities and other activities found predominantly outside the classroom have been explored to find how these can be introduced into classroom learning. This paper reports on research that has been conducted at South African Cultural Villages. It explores various activities that are predominantly done at the villages, analyses them for their mathematical content and related mathematical concepts, and shows how workers who are employed at these villages use a variety of mathematical concepts on a regular basis. The paper finally explores how such activities can be used to inform activities in mathematics classrooms.

Résumé:

Le savoir mathématique et son utilisation dans l'activité quotidienne des ouvriers de villages culturels sud-africains

Les villages culturels font partie du paysage culturel de l'Afrique du Sud depuis longtemps. Avant la naissance de la démocratie en 1994, ils arrivaient principalement à montrer la division entre les différents groupes culturels et dans un sens, ont aidé à perpétuer les stéréotypes et grossir les différences entre les différents groupes. Depuis 1994, cette focalisation a changé. Des tentatives ont été faites pour promouvoir la diversité culturelle et la richesse qui peuple ce pays. À côté de ce changement de focale, est apparu le défi d'utiliser des expériences extérieures à la classe pour influencer et mettre en rapport l'apprentissage scolaire de diverses matières. Les mathématiques se sont révélées être une des matières posant un défi majeur pour les adapter et les enseigner. Les activités ethnomathématiques et d'autres activités, principalement extérieures à la classe, ont été explorées pour trouver comment celles-ci peuvent être introduites en classe. Cet article présente une recherche qui été menée dans des villages culturels sud-africains. Il explore les principales activités en usage dans ces villages, les analyse pour leur contenu mathématique et les rapproche de concepts mathématiques, et montre comment les ouvriers qui sont employés dans ces villages utilisent régulièrement une variété de concepts mathématiques. Cet article explore finalement comment ces activités peuvent être utilisées pour impulser des activités en classe de mathématiques.

Reflecting the cultures and languages in Swedish mathematics classrooms

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Abstract:

In Stockholm and its suburban schools there are approximately 35 % minorities or immigrant students, in some schools up to 98 %. Their origins are from different countries and together they speak more than 100 diverse languages.

Over a period of time there has been a change of attitude in Swedish suburban schools regarding which language of instruction to use in mathematics education. Since long time mathematics teachers are supposed to vary teaching of mathematics in a conceptual discourse including ways of communicating mathematics in the classrooms, using problem solving as a base for understanding. According to the curriculum Swedish mathematics teachers are supposed to contrast the teaching of mathematics in relation to their students' earlier informal mathematical experiences and their communities.

Today some schools in suburban Stockholm have started immense or smaller projects teaching mathematics using student's mother tongues as languages of instruction. The teachers are bilingual themselves, having immigrant backgrounds and most of their education in their countries of origin. As the teachers have the same language and cultural background as their students we assume them to use code-switching and ethnomathematic perspectives as tools for teaching and learning mathematics. We expect all teachers to consider students first languages as resources for constructing mathematical knowledge and communicating mathematically.

Abstract in Swedish:

I Stockholm och dess förorter finns ungefär 35 % minoritets- eller invandrarelever, i några skolor upp till 98 %. De kommer från en mängd olika länder och talar tillsammans mer än 100 olika språk.

Under senare tid har det, i dessa förortsskolor, skett en attitydförändring till vilket språk det är möjligt att undervisa på. Sedan många år tillbaka förutsätts svenska matematiklärare variera undervisningen i en konceptuell diskurs, vilken inkluderar olika sätt att kommunicera matematik och att använda problemlösning som bas för förståelse och lärande. Enligt den svenska läroplanen, som har en sociokulturell inriktning, bör matematiklärare i sin undervisning utgå från elevernas tidigare erfarenheter och informella matematikkunskaper.

Idag har några skolor i Stockholmsområdet startat större eller mindre projekt i vilka lärare undervisar i matematik på elevernas modersmål. Lärarna är själva två- eller flerspråkiga och har invandrabakgrund, sin huvudsakliga utbildning har de i sina ursprungsländers utbildningssystem. Eftersom dessa lärare talar samma språk som sina elever och har samma kulturella bakgrund som dem, förutsätts de använda kodväxling och utgå från etnomatematiska perspektiv i undervisningen som redskap för lärande i matematik. Vi förutsätter också att samtliga lärare i projekten ser elevernas förstaspråk som resurser i den gemensamma konstruktionen av matematisk kunskap och kommunikation av matematik.

Is the mathematics we see the mathematics they do?

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Abstract:

After some years in a leadership position, I am returning to subject matter, teaching and research. Reopening my window to ethnomathematics, it becomes imperative to raise some questions. They are not new or original. Still, in my view they are important. They are about how *we* reflect on what *they* do, about concepts *we* identify in *their* activities, about knowledge *we* claim that *they* have.

This paper tries to illustrate the questions raised by setting out from several concrete examples, partly from the literature, partly from my own research and experience. More questions than answers are provided. Still, some lines of argument are indicated.

Sammendrag:

Etter noen år i lederstilling vender jeg tilbake til fag, undervisning og forskning. Når jeg går inn i etnomatematikken på nytt, blir det maktpåliggende å stille noen spørsmål. De er verken nye eller originale. Like fullt er de etter mitt syn vesentlige. De handler om hvordan *vi* reflekterer over hva *de* gjør, om begreper *vi* identifiserer i *deres* aktiviteter, om kunnskap *vi* hevder at *de* har.

Denne artikkelen forsøker å illustrere spørsmålene som reises ved å ta utgangspunkt i en rekke konkrete eksempler, delvis fra litteraturen, og delvis fra egen forskning og erfaring. Det blir stilt flere spørsmål enn det gis svar. Noen resonnementer blir imidlertid antydnet.

Rethinking ethnomathematics research

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Abstract:

Research in ethnomathematics is needed to preserve what might be considered the cultural mathematics of a particular community. It is important to describe and analyse this mathematics before it is lost. Some of the current ethnomathematical knowledge such as the counting system records and analyses in PNG are at the description or content analysis level. This is an essential aspect of ethnomathematical research. However, ethnomathematics research needs to consider other aspects of ethnomathematics besides content analysis. The current knowledge resides with those who may be elderly while the researchers are younger members of the community. The relationship between people and the place of the ethnomathematical knowledge in the cultural practices and relationships needs to be recognised. The values embedded in the way the mathematics is presented and learnt is as important in the realm of ethnomathematics as it is in school mathematics. One of the challenges for the young researcher is to be critical and reflexive and to know not only the right questions to ask but also when to ask, whom to ask and what not to ask. The cultural expectations on the researcher need to be recognised as the research is gathered.

Resumen:

Repensando la investigación etnomatemática

La investigación en etnomatemáticas es necesaria para preservar lo que puede considerarse como las matemáticas culturales de una comunidad particular. Es importante describir y analizar estas matemáticas antes de que se pierdan. Algunos de los conocimientos etnomatemáticos actuales, como los relativos a la identificación y análisis de los sistemas de conteo en Papua Nueva Guinea, se sitúan en un nivel de descripción o análisis de contenido. Este es un aspecto esencial de la investigación en etnomatemáticas. Sin embargo, la investigación en etnomatemáticas necesita tener en cuenta otros aspectos de las etnomatemáticas además del análisis de contenido. El conocimiento actual reside en los que posiblemente son ancianos, mientras que los investigadores son miembros jóvenes de la comunidad. Debemos reconocer la relación entre la gente y el lugar del conocimiento etnomatemático en las prácticas y relaciones culturales. Los valores subyacentes en las formas en que se presentan y se aprenden las matemáticas es tan importante para el dominio de las etnomatemáticas como para las matemáticas escolares. Uno de los retos que se plantean al joven investigador es el de ser crítico y reflexivo y ser capaz no sólo de saber qué preguntas formular sino también saber cuando y a quién formularlas y conocer qué preguntas no deben ser formuladas. Deben reconocerse las expectativas culturales del investigador durante el proceso de investigación.

Studying mathematical objects in class, the example of the Chinese abacus

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Abstract:

First of all, we will study the Chinese abacus asking directly to participants the question of the instructions for use. How does it work? And also, what might a student answer to this question? Secondly, we will present some theoretical points of our research. In particular, we will discuss the notion of mathematical object. What kind of material mathematical objects can be study in class? Why and how can we introduce them in class? We propose to study the material mathematical objects by asking a *question of research*: How does it work? and we analyze this kind of activity like a *situation of research* which necessitates the mobilization of *notional knowledge* (relative to a notion) and *transversal knowledge* in mathematics.

Résumé:

Étude d'objets mathématiques en classe, le cas du boulier chinois

Tout d'abord, nous étudierons le boulier chinois en posant directement aux participants la question de son fonctionnement. Comment ça marche ? Et aussi, que pourrait répondre un élève à cette question ? Ensuite, nous présenterons quelques points théoriques de notre recherche. En particulier, nous discuterons la notion d'objet mathématique. Quelles sortes d'objets mathématiques matériels peut-on étudier en classe ? Pourquoi et comment les introduire en classe ? Nous proposons d'étudier les objets mathématiques matériels en posant une *question de recherche* : Comment ça marche ? et nous analysons ce type d'activité comme *situation de recherche* qui nécessite la mobilisation de *savoirs notionnels* et de *savoirs transversaux* en mathématiques.

On a possibility of creating or translating mathematics terminologies

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Abstract:

The purpose of this talk is to suggest a method of creating or translating mathematics terminologies.

Nowadays, it seems that many peoples in non-industrialized area are trying to speak and write mathematics in their own languages to build up their own mathematics education. One of the difficulties in those trials may be that they occasionally don't have exactly corresponding words to Western mathematics terminologies. Such a difficulty follows about any cultural exchanges generally. My suggestion to tide over such a difficulty is that we should refer to terminologies from various cultures. For, in my observation, Western mathematics terminologies are often inappropriate for beginners of mathematics learning even in the Western culture. In addition, some mathematics terminologies in non-Western cultures are better in the expression of their concepts than those of Western's. For example, Chinese and East Asian people have their own words "triangle with two equal edges" or "weifen" corresponding to the words "isosceles triangle" or "differential," respectively. It seems that the word "triangle with two equal edges" naturally represents its meaning in everyday language compared to the word "isosceles triangle." Furthermore the word "weifen" decomposes its meaning into micro (wei) and division (fen). It's a creation rather than a translation by Chinese people, and seems to express its concept more exactly than the original word "differential." These seem to suggest the efficiency of peoples' referring to those from various cultures in creating or translating mathematics terminologies fitting to their own culture.

If the suggestion is welcomed, I wish to join in such works of new cultural exchange as a mathematician in East Asia.

概要

数学用語の造語・翻訳の可能性について

本講演の目的は、数学用語の造語ないしは翻訳する上での方法を提案することです。

今日、非工業化地域の多くの人々が数学を自分たち自身の言語で語り、書こうとしているように見受けられます。こうした試みにおける困難の一つは、これらの人々が用いている言語の中に、西欧の数学用語にぴったりと対応する言葉がない場合にもつきまとうことです。

このような困難をのり越えるために、私は、さまざまな文化圏における用語を参照することを提案したいと思います。というのは、私が見るところ、西欧の数学用語が、西欧文化圏における数学学習の初心者にとってさえ、しばしば不適切であることがあるからです。また、非西欧文化圏における数学用語の中には、西欧文化圏におけるものよりも、その概念をうまく表現しているものがあるからでもあります。たとえば、中国や東アジアの人々は、"isosceles triangle" とか "differential" といった言葉に対応するものとして、「二等辺三角形」とか「微分」といった彼ら独自

の言葉を持っています。「二等辺三角形」という言葉は、“isosceles triangle”と較べて、その意味を日常用語をつかってうまく表現しているように思われます。さらに、「微分」という言葉は micro (微) と division (分) という二つの言葉の合成語となっています。これは、中国の人々による翻訳というよりは造語というべきものであり、しかも元の “differential” という言葉よりもその意味を正確に表しているように思われます。これらの例は、人々が、西欧の数学用語に対応する言葉を彼らの独自の言葉を用いてつくりあげる、ないしは翻訳する上で、さまざまな文化圏における用語を参照すべきであるということを示唆しているように思われます。

この提案が歓迎されるということであれば、私は、東アジアの数学者として、こうした新たな文化交流に参加したいと考えています。

Ethnomathematics in global education programs

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Abstract:

Many schools are recognizing the need for students to gain a broader world view, especially in the post-9/11 setting. There is concern about citizens' narrow view of the world, often lacking basic geographic knowledge such as locations of countries, and even less likely to know about cultures and societies. It is argued that much more global education needs to be included in school curricula. Whether it is one unit in one class or the overall mission of the school, it brings the world into the classroom. Often, it also takes the classroom out into the world.

Although schools often start global education with social studies, the arts, and literature, educators later realize that the sciences and mathematics also link to the world. This is where ethnomathematics can play an important role. Given standardized requirements in mathematics content, certain mathematical concepts and skills must be covered, but often even these can be treated from the point of view of mathematics from around the world and from the structures of world cultures. Examples and implications will be discussed.

Resumen:

Muchas escuelas reconocen la necesidad de que los estudiantes ganen una visión del mundo más amplia, sobre todo en el ambiente post-9/11. Hay preocupación por la visión estrecha del mundo que tienen los ciudadanos, con falta, a menudo del conocimiento geográfico básico como, por ejemplo, dónde se sitúan los varios países, y aún menos probable el conocimiento de las culturas y de las sociedades. Se dice que hay que incluir una educación mucho más global en los planes de los estudios escolares. Si es una unidad en una clase o la misión global de la escuela entera, así entra el mundo al aula. A menudo, también lleva el aula al mundo.

Aunque a menudo las escuelas comiezan la educación global con los estudios sociales, las artes, y la literatura, después los educadores se dan cuenta de que las ciencias y las matemáticas también unen el mundo. Es aquí donde las etnomatemáticas pueden desempeñar un papel importante. Dado ciertas exigencias estandarizadas en el contenido de las matemáticas y que hay que enseñar ciertos conceptos y las habilidades relevantes a las matemáticas, aun así hasta éstos pueden ser tratados desde el punto de vista de las matemáticas de alrededor del mundo y desde las estructuras de las culturas mundiales. Se presentarán y se discutirán ejemplos e implicaciones.

Symmetry and gold section: two mathematical ideas incorporated in the tradition of Xysta (Pyrgi-Chios-Greece)

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Abstract:

A designing tradition: the Xysta (sgraffiti) of Pyrgi (one of Chios' Medieval villages) is presented here. This tradition constitutes of the construction of designs on houses' facades through scratching the plaster, by traditional craftsmen, who have been taught this technique from older craftsmen. Through First-hand material for this study that was collected on the spot by the author herself during last summer the study is focused on two important mathematical ideas: symmetry, gold section, that both are met in the nature as well as in any kind of art and in every culture.

Résumé :

Symétrie et section d'or : deux idées mathématiques présentes dans la tradition du Xysta (Pyrgi-Chios-Grèce)

Une tradition de dessin : les Xysta (sgraffite) de Pyrgi (un des villages médiévaux de Chios) sont présentés ici. Cette tradition consiste en la réalisation de motifs sur les façades des maisons, par grattage du plâtre. Ceci est réalisé par les artisans traditionnels, qui tiennent cette technique des anciens artisans. Pour cette étude, l'auteur a recueilli elle-même les motifs sur le site, l'été dernier. Cette étude se focalise sur deux idées mathématiques importantes : symétrie et section d'or, qui chacune se rencontre dans la nature autant que toutes les formes d'art dans toutes les cultures.

Sociocultural view on relationship between school failure and mathematics education: a case study

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Abstract:

The wider sociocultural environment in which a student is educated constitutes a main interpretative context for the construction of his relation with the knowledge and the learning process. We try to study the students' school failure phenomenon in a well defined region, in which specific sociocultural and territorial characteristics have an important influence in the students' choices. Our project¹ concerns the interaction between mathematics education and school failure in Dodecanese area in Greece. Dodecanese is constituted of twelve islands, with a wide population diversity as well as diversity in educational structures in every island. The objective of this project is the development of sufficient criteria for the selection of variables in order to propose reparative actions.

The main focus of the research program is on the exploration of the kind of influences in the students' community by the family and the greater society's environment, as well as students' personal school-routes as a variable for the study of the relation between mathematics education and school failure. The data are collected by interviews with students, teachers and members of students' families. Through the semi-structured interviews the above members of a micro culture, state their beliefs about: the education system, the mathematics education, their own role and the role of others regarding school failure as well as failure in mathematics.

It is going to be presented in this report the first results of a case study, concerning a student with an experience in school failure, who was obligate to remove a few times to different islands and to change educational orientation in order to be able to continue school.

Résumé :

Point de vue socioculturel sur la relation entre échec scolaire et enseignement mathématique : une étude de cas

L'environnement socioculturel le plus large dans lequel un élève fait ses études constitue un contexte interprétatif principal pour la construction de sa relation au savoir et de son processus d'apprentissage. Nous essayons d'étudier le phénomène d'échec scolaire des élèves dans une région bien définie, dans laquelle des caractéristiques socioculturelles et territoriales spécifiques ont une influence importante sur les choix des élèves. Notre projet² concerne les interactions entre

¹ "The interaction between mathematics education and school failure in island areas: interpretation and confrontation in the case of Dodecanese Islands" (Pythagoras, Aegean University): This research program is co-financed by 3rd CSF of EEC.

² "L'interaction entre enseignement mathématique et échec scolaire dans les îles: interprétation et confrontation, le cas du Dodécanèse" (Pythagoras, Université d'Egée) : ce programme de recherche est co-financé par le 3^{ème} CSF de l'UE.

l'enseignement mathématique et l'échec scolaire dans la région du Dodécanèse en Grèce. Le Dodécanèse est constitué de douze îles, avec une grande diversité de populations, engendrant autant de diversité pour les structures éducatives de chaque île. L'objectif de ce projet est de développer des critères suffisants pour sélectionner des variables afin de proposer des actions efficaces.

Le point principal de ce programme de recherche est sur l'exploration du type d'influences de l'environnement des élèves : la famille et l'environnement social plus large, tout comme les parcours scolaires individuels des élèves sont une variable pour l'étude de la relation entre l'enseignement de mathématiques et l'échec scolaire. Les données sont constituées par des entretiens avec les élèves, les enseignants et les membres des familles des élèves. Par des entretiens semi-dirigés, ces membres d'une même micro-culture déclarent leurs convictions sur : le système éducatif, l'enseignement de mathématiques, leur propre rôle et celui des autres concernant l'échec scolaire aussi bien que l'échec en mathématiques.

Cet article présente les premiers résultats d'une étude de cas, concernant un élève en échec scolaire, qui a été obligé de déménager plusieurs fois sur différentes îles et de changer d'orientation scolaire afin de continuer l'école.