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The Algebra of Weaving Patterns, Music and the Kinship System of the Kankana-eyes of Mt. Province

By: The Faculty of the Discipline of Mathematics

The basic challenge mathematics education is now facing is how to teach mathematical concepts in formal or non-formal instruction within the perspective of mathematics in practice.

Towards this end, the U.P. College Baguio Mathematics Faculty examined the indigenous mathematical knowledge of the Cordillera Region; that can be used as starting points for the development of instructional materials for formal and non-formal curricula in the region.

The group identified three areas of the Kankana-ey culture where mathematical principles are operative: weaving patterns, gong music and the kinship system.

These three features of Kankana-ey culture are manifested in important community activities, like the wedding ritual. The traditional woman's skirt called *tapis* is worn for such special occasion. The playing of brass gongs called *gangsa* and a drum called *solibao* predominate the musical atmosphere. The wedding ritual cannot be complete without the celebration of the genealogy of the wedded couple from the elders called *lallakay*.



RESULTS AND FINDINGS

WEAVES. The Kankana-ey weaves considered in this study are blanket or *ules*, woman's skirt or *tapis*, woman's waistband or *bakget* and man's loincloth or gstring or *wanes*. The strip patterns found in these weaves were obtained from four motifs namely: *sopo*, *tiktiko*, *matamata* and *kulibangbang*. Such patterns were classified according to the established seven frieze patterns.

If teachers and educators consider the mathematical practices that learners employ in everyday life and make use of this knowledge to introduce mathematical ideas and concepts; then mathematics would begin to interest them.

Most of the informant weavers claim that their designs represent objects and people seen in their environment: the *tiktiko*, mountain foot trails and zig-zag mountain roads; the *matmata*, a bird's eye; the *sopo*, a flower and the *kulibangbang*, a butterfly.

GONG MUSIC. The music analyzed in this study is based on those produced by gongs and other instruments. To produce gong music, a specific beat scheme is followed by the instruments, each of which has a beat pattern. A beat pattern consists of beats repeated at regular intervals and its basic unit is a cluster of four beats.

To understand the mathematical structure found in gong music, each of the four beats of a beat pattern of an instrument is given a value of 0 or 1, transforming it into a sequence of 0s and 1s, called a beat code. Each beat code represents the distinct rhythm produced by an instrument. An operation of these beat codes is induced when playing of one instrument is joined by the playing of another instrument. In a sense, the rhythm of the first instrument is now combined with the rhythm of the second, creating some rhythm. Following this analysis, the *Takik* Ensemble, which is one of the gong music played during wedding rituals was found to define an algebraic structure which is the Klein-4 group.



KINSHIP. Every Kankana-ey belongs to two important groups of people. His personal kindred is closely related to him through both sexes and furnished him with certain rights and obligations. The *sinpangapo* is related to him by blood and can actually trace relationship to a common ancestor.

In the Kankana-ey kinship, the ego recognizes, as members of his personal kindred, all relatives up to fourth degree cousins in both the father and mother side. Also part of the ego's kindred are those belonging to the fourth ascending and descending generations. The Kankana-ey kinship is, thus, a bilaterally structured system.

CONCLUSION AND RECOMMENDATIONS

This research shows that mathematics is concretely present and operative in the indigenous culture of the Kankana-ey of Mt. Province. The results form the baseline for the development of more relevant and responsive mathematics curricula in formal and non-formal education. This research may also pave the way for a comprehensive study on the presence of algebraic structures in the diverse cultures of the different indigenous people in the country.

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