Statement of the Problem

The study aimed to document the Isnags' Indigenous Mathematical Concepts. Specifically, it aims to:

- determine mathematical concepts related to measurement, counting, geometry, and other related fields in math.

- identify indigenous knowledge on weather prediction and calendar of the *Isnags* in relation to mathematics.

Scope and Delimitation of the Study

- The range of the study was focused on the identification and documentation of Indigenous Mathematical Concepts and it was delimited to the *Isnag* people of Calanasan, Apayao.

Research Paradigm

Phase I

Listing, interviewing and categorization of indigenous mathematical concept

Phase II

Development (First draft)

Phase IV

Validation for correction by the experts

Phase III

Development (second draft)

Phase V

Focus group discussion and final presentation

Phase VI

Final output

Research Design

- descriptive survey method of research with Key Informant Interview, Observation, and Focus Group Discussion.

- **Locale of the Study-** Municipality of Calanasan, Apayao

Respondents of the Study

- The participating respondents of the study were the old folks and educators who have knowledge on the Mathematical Concepts of the *Isnags*. Secondary data were taken from existing documents in the municipality.

Data-Gathering Tools

- The study made used of Key Information Interview (KII), observation and Focus Group Discussion (FGD) as the tools for data-gathering. Photos were taken as evidence of the existence of the concepts. Data were presented in narrative form.

IDENTIFYING THE TIME

Table 1.Isnag's terms of the time of the day

ISNEG TERMS	EQUIVALENT
Mun-onatarautanu'	3 a.m.
Pagbarngat	Sunrise
Mangalintutugu/ matuun	12 highnoon
Mamreg	Afternoon
Si'si'dam	Sunset
Lamag	Late night
Tangngagabi	12 mid night

Mun-onatarautanu

- First crow of the rooster in the morning indicates 3 a.m. approximately.

Pagbarngat

- When the shadow falls westward it indicates dusk

Mangalintutugu/matuun

- When the shadow is in line with the body indicates approximately 12 high noon

Mamreg

- When the shadow fall eastward indicates afternoon.

Si'si'dam

- Twilight.

Lamag

- Late night.

Tangngagabi

- 12 mid night.

Ri'rit

- Morning cicada, it is also one of the basis in determining time when the night and morning is coming nearer. When they are in the middle of the forest or mountain this is the time for hunting wild *animals for their food*.

Kalaw/horn bill

- The sound of the kalaw/horn bill during day time, it is a sign for 12 high noon

IDENTIFYING TIME

- The time of the day was determined through the biological clock of some animals like the first crow of the rooster/chicken early in the morning indicates the time of 3:00 a.m., the call/sound of the hornbill indicates the time of 12:00 noon, and the sound of the morning cicadas indicates that it is already dawn and setting. The sun can also be an instrument in determining the time of the day depending on the shadow of a certain thing.

Isnag's way of determining the months of the year

ISNEG TERMS	EQUIVALENT
Agbabaang	January
Agbabalu	February
Pinagsisi'dug	March
Pinagtutugnu	April to May
Pinagbaballat	June to early July
Dawdawat	Late July to early August
Pinagbubusa	Late August to early September
Pinaggagani	Late September to November
Pinag-ooman	November to December

Agbabaang/(January)

- While waiting for the kaingin to reach the period of its dryness for the process of burning, they prepare another land where they plant vegetables and root crops.

Agbabalu/(February)

- Planting root crops and vegetables serving as a supply in the *kaingin*.

Pinagsisi'dug/(March).

- The process of burning the prepared kaingin.

Pinagtutugnu/(April-May).

- The process of drilling the palay

Pinagbababallat/(June-early July).

- The process of weeding in the kaingin

Dawdawat/(late July-early August).

- Resting period while waiting for the palay to reach its harvest period.

Pinagbubusa/(late August-early September).

- Flowering stage of the palay

Pinaggagani/(late September –October).

- Harvesting period

Pinag-ooman/(November-December

- Preparation of *kaingin* by cutting all the trees to a certain land

MEASURING HARVEST

Table 3. Isnag's way of determining their harvest measurement.

ISNEG TERMS	EQUIVALENT
Batta	One bundle/ three grip full
Ngesing	Four bundle
Uyun	Ten ngesing/ forty bundles
Mopu	Ten uyun/ four hundred bundles
Matungal	Ten mopu/ four thousand bundles

Batta

- One bundle / 3 grip full

Ngesing

- 4 *batta* / bundle.

Uyun

- 10 *ngesing/* 40 bundles

Мори

Matungal

- 10 *mopu/* 4000 bundles

Isnag's way of measuring length

ISNEG TERMS	EQUIVALENT
Pir-it	One finger node
Ramayan	Finger length
Dahulap	Palm size/ length
Dangan	Fore finger length to index
Dappa	Arm length
Dapan	Foot length

Pir-it

- One finger node.
- Smallest unit of measuring length.
- Use for estimating the amount of water in cooking rice.

Ramayan

- Finger length

Dahulap

- Palm size/ palm length

Dangan

- Fore finger length to index.

Dappa

- Arm Length

Dapan

- Feet length

Isnags' way of measuring height.

ISNEG TERMS	EQUIVALENT
Bingbingkal	Length from the ankle to foot
Tuudan	Length from the knee to foot
Abagaan	Length from the shoulder to foot
Bu'lawan	Length from the neck to foot
Uluwan	Length from the head to foot

VOLUME, WEIGHT AND AREA

- volume: (***mangkalawanayaalang***) as wide as a rice granary.

Weight: (***mangkadammataltung***) as heavy as a wooden mortar

Isnag's way of measuring distance

ISNEG TERMS	EQUIVALENT
Tangatanapan	One plain travelling distance
Tangabantay	One mountain hike travelling distance
Tangaba'langan	One stream cross travelling distance

Tangatanapan

- Pertains to one plain traveling distance.

Tangabantay

- Pertains to one mountain hike traveling distance.

Tangaba'langan

- Pertains to one stream cross traveling distance.

Isnag's way of identifying location or direction

ISNEG TERMS	EQUIVALENT
Daya	Upstream
Allod	Down stream
Ambaw	Lower portion of the terrain
Angatu	Higher portion of the terrain

Isnag's way of counting numbers

ISNEG TERMS	EQUIVALENT
Isa	One
Dua	Two
Tallu	Three
Appat	Four
Lima	Five
Annam	Six
Pitu	Seven
Walu	Eight
Syam	Nine
Sangapulo	Ten
Sangagasut	One hundred
Sangaribu	One thousand

Isnag's terms for selected fractions

ISNEG TERM	EQUIVALENT
Tangabuhal	One-whole
Tangaguddwa	One-half
Apakkal'lu	One-third
Apakkappat	One-fourth
Apakkalima	One-fifth
Apakkannam	One-sixth
Apakkapitu	One-seventh
Apakkawalu	One-eighth
Apakkasyam	One-ninth
Apakkasangapulu	One-tenth

Isnag's terms for the selected concepts on geometry

ISNEG TERM	EQUIVALENT
Libuttu	Plane circle
Libukkag	Spherical
Siyu	Corner
Bihat	Side
Tallusiyu/tallubihat	Triangle
Appatsiyu/appatbihat	Square/rectangle
Lima siyu/lima bihat	Pentagon
Annam siyu/annambihat	Hexagon
Pitusiyu/pitubihat	Heptagon
Walusiyu/walubihat	Octagon
Syamsiyu/syambihat	Nonagon
Sangapulusiyu/sangapulubihat	Decagon

Isnags way of determining the weather

ISNEG TERM	EQUIVALENT
Mang-rait	Clear night/ long sunny day
Gitub	Steady clouds/ heavy rain
Layus	Crabs come-up from the water to land/ flood
Yagyag	Cockroaches coming-out/ earthquake
Annag	Birds came from different location to another location/ strong storm

Summary

- **R**esults revealed that time of the day was determined through the biological clock of some animals like the first crow of the rooster/chicken early in the morning indicates the time of 3:00 a.m., the call/sound of the hornbill indicates the time of 12:00 noon, and the sound of the morning cicadas indicates that it is already dawn and setting. The sun can also be an instrument in determining the time of the day depending on the shadow of a certain thing.

Summary

- The Isnags have their way of identifying the months of the year was based from the planting life-style of the tribe most specially the *kaingin* system (planting palay in the mountain by burning method).
- In measuring their harvest they used the *Isnag*terms such as *Batta*, *ngesing*, *uyun*, *mopu*and*matungal*. by burning method).
- The instrument used in determining the length measurement by the Isnag was some body parts such as the arm, finger, and the foot

Summary

- The instrument used by the Isnags was by the parts of their body such as shoulder, neck, head, ankle, knee and sole. They used the combination of two body parts in measuring height.
- In measuring long distances, they estimate it by using the distances of streams, mountains and plains. The time they had travelled in a distance was measured through the fractional quarters of one whole day like ***tangaldaw*** which means to one whole day**,** ***tangagabi*** which means to one night and ***tangagudwaaldaw*** means one – half day**.**

Summary

- The location or direction depends on the water ways either river or brook.
- The counting numbers of the Isnag are related to the other usual counting numbers in English terms.
- Some animals like the crabs, cockroaches and birds and the condition of the sky was used as the instruments in determining the weather

CONCLUSION

- Based from the findings, there are 2 indigenous mathematical concepts related to time/calendar (Identifying time and Months of the year), 5 concepts related measurement (Measuring harvest, measuring length, measuring height, measuring volume, area and weight, and measuring and estimating distance), 1 concept related to direction (Identifying location/direction), 1 concept related to counting (terms for counting numbers), 1 concept related to fraction (terms for selected fractions), 1 concept related to geometry (terms for selected polygons and shapes), 1 concept related to color (terms for selected colors), and 1 concept related to weather (determining the weather forecast).

RECOMMENDATIONS

- Indigenous mathematical concepts be studied as a means for children to learn that their ancestors contributed to the development of important mathematical ideas. As a result, the students would be more inclined to learn math because they will see the relevant and significant to their own lives.
- Verify the veracity of the indigenous concepts using standard instruments.
- Similar study should be conducted to other tribes in Apayao

THANK YOU!!!

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