



Society of St. Francis Xavier, Pilar's

Fr. Conceicao Rodrigues College of Engineering

Fr. Agnel Technical Education Complex Bandstand
Bandra (West) Mumbai -400 050

IKS11XXX01: INDIAN KNOWLEDGE SYSTEM

नवेन अनवं शोधयेत् | कौटिल्य

Review the Past with modern perspective -
Kautilya

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Moulding Engineers Who Can Build the Nation

INDIAN KNOWLEDGE SYSTEM



Course Code	Course Name	Teaching Scheme (Hrs/week)				Credits Assigned		
		L	T	P	L	T	P	Total
2	--	--	2	--	--	--	--	2
IKS11EC01	Indian Knowledge System	Examination Scheme						Total
		ISE1	MSE	ISE2	ESE	Total		
		Theory	50	--	50	--	100	
Course Outcomes	CO1	Lab	--	--	--	--	--	--
	CO2	After the successful completion students should be able to :						
	CO3	CO1 Enumerate the main characteristics of education system in Vedic and post Vedic period to enrich the intellectual imagination						
	CO4	CO2 Review the ancient discovery and research in Indian number system and ancient Indian mathematics						
	CO5	CO3 Review the contribution from Ancient Indian system to astronomy and metallurgy in Irrigation, painting, surgical techniques and shipbuilding						
Moulding Engineers Who Can Build the Nation	CO1	CO4 Trace the significant developments in Indian engineering and technology in Irrigation, painting, surgical techniques and shipbuilding						
	CO5	CO5 Cultivate a deep sense of identity and pride in enriched scientific Indian heritage						

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INDIAN KNOWLEDGE SYSTEM

Module No.	Unit No.	Topics	Ref. Hrs.
1	1.1	What is Indian Knowledge System (IKS)? Why do we need it? Salient aspects of IKS.	1 2
	1.2	The Vedic Corpus: Introduction to Vedas, Sub-classification of Vedas, Messages in Vedas, Vedic Life: A Distinctive Features	1 3
2	2.1	Number systems in India, Measurements for time, distance, and weight, Bhūta-Samkhya system, Kāṭapayādi system, Pingala and the Binary system	1 4
	2.2	Unique aspects of Indian Mathematics, Indian Mathematicians and their Contributions, Algebra, Geometry and Trigonometry	1 4
3	3.1	Indian contributions in astronomy, The celestial coordinate system, Elements of the Indian calendar, Notion of years and months, Indian Astronomical Instruments	1 4
	3.2	Wootz Steel, Mining and ore extraction, Metals and Metallurgy Technology, Iron and steel in India, Lost wax casting of idols and artefacts, Apparatuses used for extraction of metallic components	1 4
4	4.1	Irrigation systems and practices in South India, Dyes and painting technology, Surgical techniques, Shipbuilding	1 3
	4.2	Temple architecture in India, Perspective of Arthaśāstra on town planning.	1 2
		Total 26	
		Moulding Engineers Who Can Build the Nation	



INDIAN KNOWLEDGE SYSTEM

Recommended Books:

1. B Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R. N., “Introduction to Indian Knowledge System: Concepts and Applications” PHI, 2022
2. Kapil Kapoor, Avadhesh K. Singh, “Indian Knowledge Systems, Volume 1”, Indian Institute of Advanced Study, 2005
3. R. P. Kulkarni, “Glimpses of India Engineering and Technology: Ancient and Medieval Period,” Munshiram Manoharlal Publishers Pvt. Ltd., 2018



Web Resources

- <https://iksindia.org/>
- <https://www.namami.gov.in/>
- <https://bharatiyakhel.in/>
- https://www.youtube.com/@IKS_Media_MoE/videos
- <https://iksindia.org/lectures-and-videos.php>

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Course Assessment:

ISE-1: Quiz: 20 Marks

Activity: Creative Activity (any one of the following): 30 Marks

1. Website design
2. App Making/ Game Design
3. Physical Prototype
4. Design of Experiment
5. Short Film Making

ISE-2: Quiz: 20 Marks

Activity: Creative Activity (any one of the following): 30 Marks

1. Website design
2. App Making/ Game Design
3. Physical Prototype
4. Design of Experiment
5. Short Film Making

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INTRODUCTION TO IKS



भद्राया सुमतौ यतेम |
-ऋग्वेद (६. १. ३०)
Let us strive for the wisdom that leads to the welfare of all

Dr. Surendra Singh Rathod

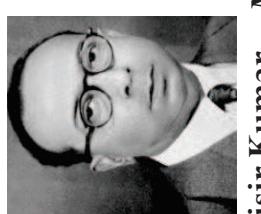
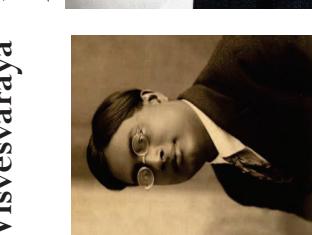
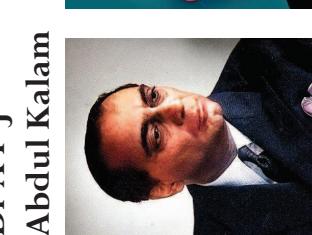
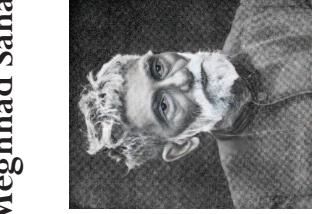
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Pride of India- Indian Scientists



8

Pride of India- Indian Scientists



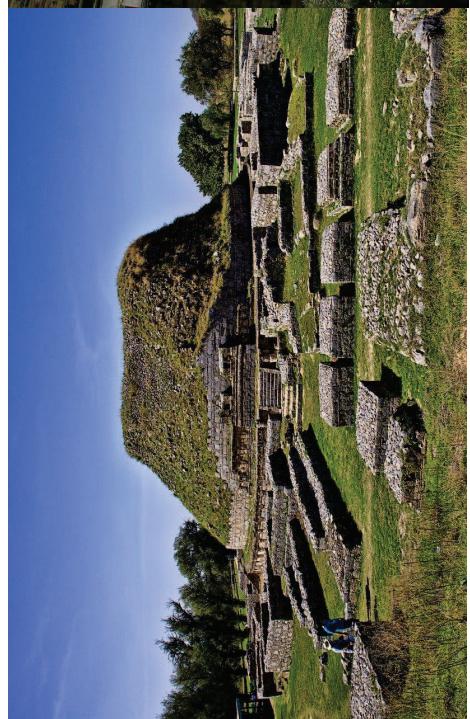
	Varahamihira
	Aryabhatta
	Bhaskara II
	Acharya Nagarjuna
	Acharya Kanada
	Acharya Patanjali
	Acharya Charaka
	Acharya Bhardwaj
	Acharya Chanakya
	Acharya Sushruta
	Brahmagupta

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Sushruta	Medicine
Charaka	Ayurveda
Kanada	Vedic atomic theory
Patanjali	Yoga Sutras
Aryabhatta	Mathematics and Astronomy
Varahamihira	Mathematics and Astronomy
Brahmagupta	Mathematics
Chanakya	Arthashastra (political treatise)
Bhardwaj	Physics
Bhaskara I	Mathematics
Bhaskara II	Mathematics
Nagarjuna	Alchemy
Pingala	Poet and Mathematician (Binary Number System)

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Insights.....

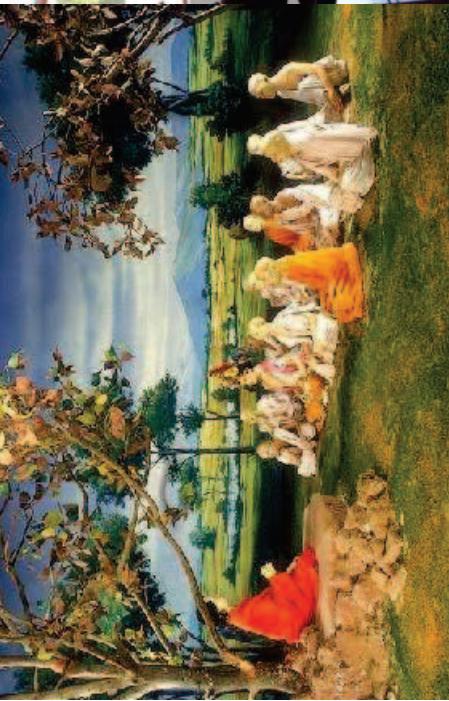


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Insights.....



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SHATTERED UNIVERSITIES OF ANCIENT INDIA



Ratnagiri University

Vikramshila University

Somapura University

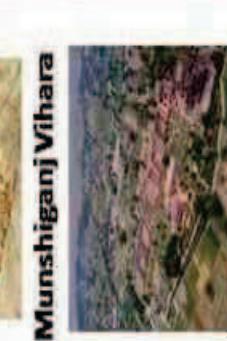
Nalanda University

Pushpagiri University

Jagaddala University

Takshashila University

Brihadeeswara Temple

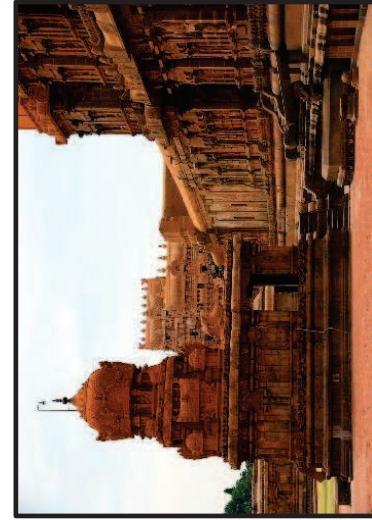


These temples of knowledge, were parched with thousands of its teachers and students by invaders to put an end to the glorious Indian Vedic education..

INDIA WAS THE ONLY COUNTRY TO HAVE UNIVERSITY EDUCATION IN ANCIENT TIMES.. THE REASON WHY THEY WERE ALL SHATTERED BY INVADERS

Brihadeeswara Temple

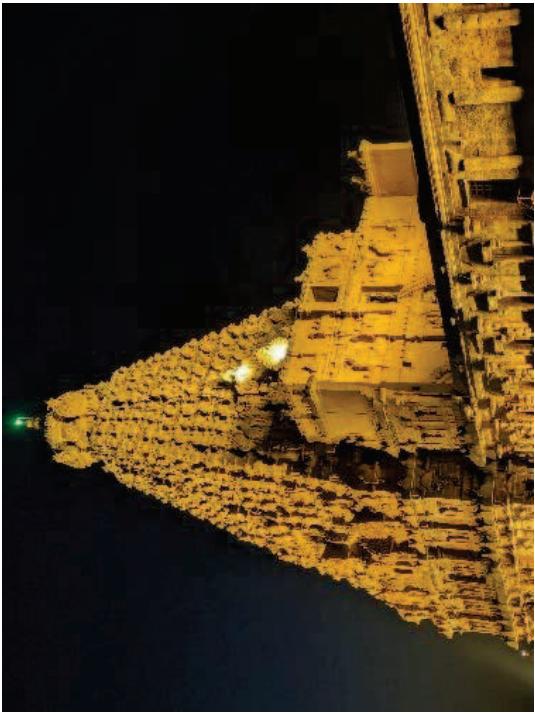
Built by Raja Raja Chola I. The construction was completed in 1010. This is one of the earliest granite temples in the world. Around 60,000 tons of granite is said to be used to build the temple. It has one of the tallest vimānam (temple tower) and its kumbham (the structure on the top) weighs approximately 80 tons.



Source: https://upload.wikimedia.org/wikipedia/commons/7/7d/Brihadeeswara_Temple_Full_View.jpg



Brihadeeswara Temple

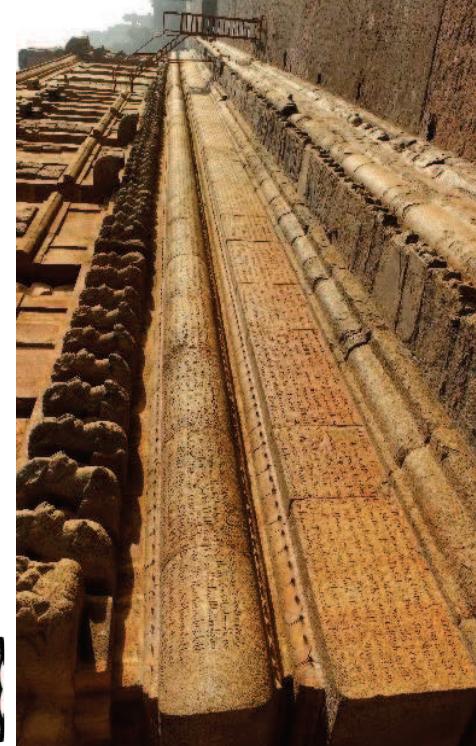


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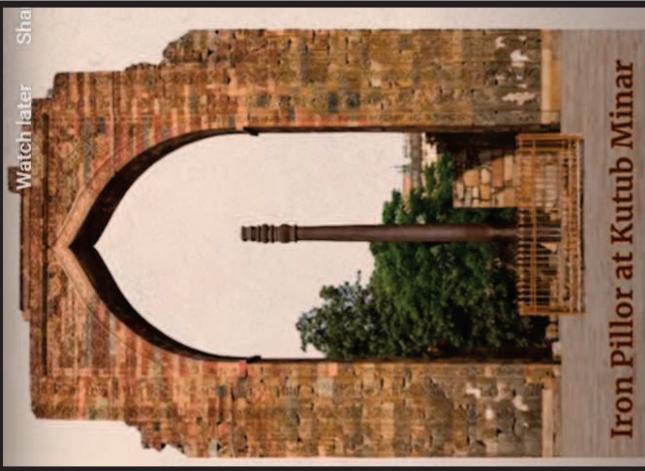


Brihadeeswara Temple



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IRON PILLAR

- At Kutub Minar ,which weighs about 6,000 kgs
- At Dhar, which weighs 7,000 kgs
- Another on Mount Abu

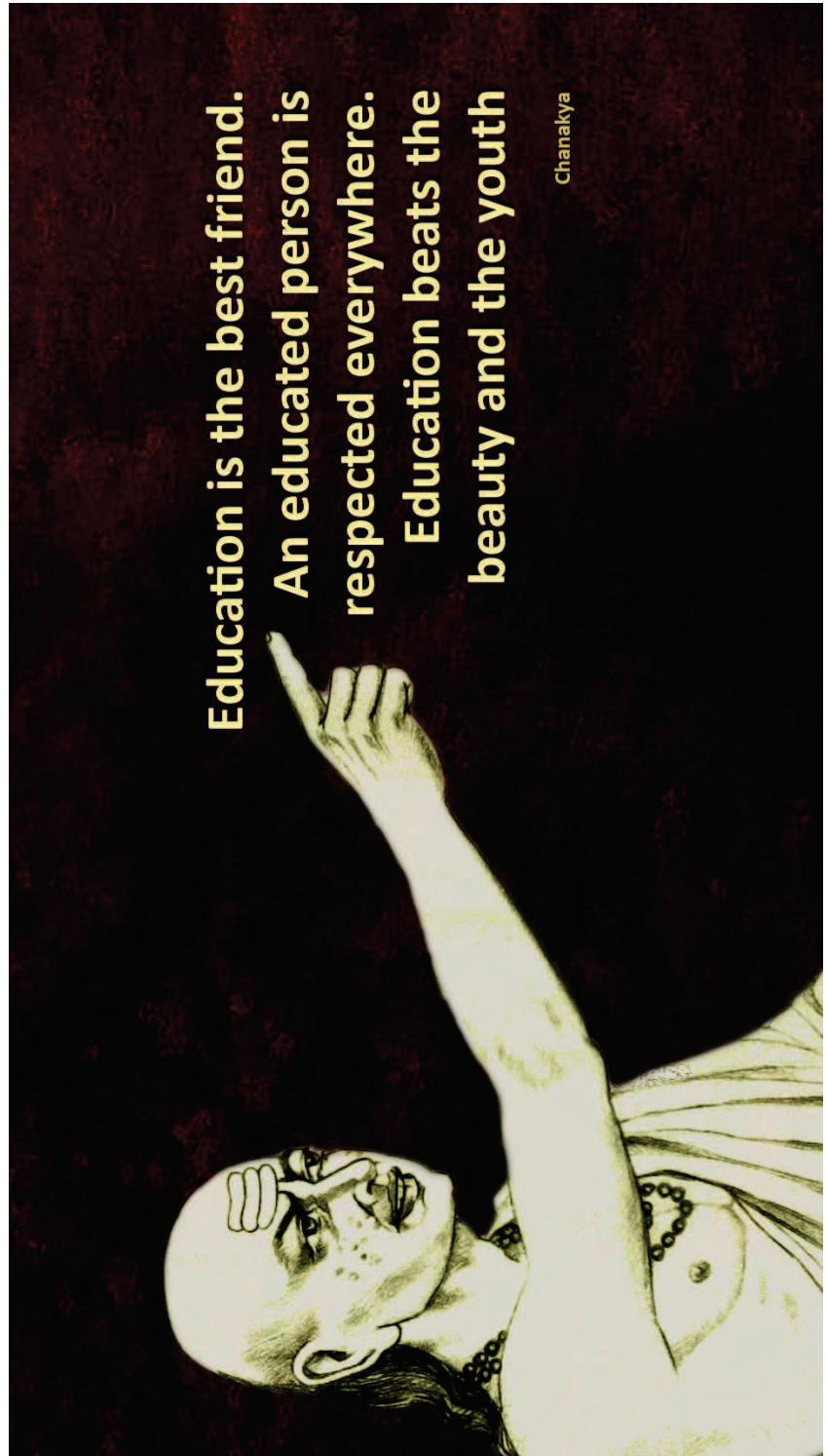
- Pañca-Joha -Combination of five metals- Gold, Silver, Lead, Copper, and Zinc

- Madhūcchiṣṭa Vidhānam- Replication of original sculpture using beeswax.

Iron Beams

- Numerous iron beams at Puri and Bhubaneswar
- 29 iron beams in the Konark temple in Orissa

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Let us look back.....

Thomas Babington Macaulay



LORD MACAULAY'S ADDRESS TO THE
BRITISH PARLIAMENT 2 FEBRUARY, 1835

"I have travelled across the length and breadth of India and I have not seen one person who is a beggar, who is a thief, such wealth I have seen in this country, such high moral values, people of such caliber, that I do not think we would ever conquer this country, unless we break the very backbone of this nation, which

is her spiritual and cultural heritage, and, therefore, I propose that we replace her old and ancient education system, her culture, for if the Indians think that all that is foreign and English is good and greater than their own, they will lose their self esteem, their native culture and they will become what we want them, a truly dominated nation."

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Let us look back.....

"I have no knowledge of either Sanskrit or Arabic. But I have done what I could to form a correct estimate of their value. I have read translations of the most celebrated Arabic and Sanskrit works. I have conversed both here and at home with men distinguished by their proficiency in the Eastern tongues. I am quite ready to take the Oriental learning at the valuation of the Orientalists themselves. I have never found one among them who could deny that **a single shelf of a good European library was worth the whole native literature of India and Arabia.**"

"I feel with them that it is impossible for us, with our limited means, to attempt to educate the body of the people. We must at present do our best **to form a class who may be interpreters between us and the millions whom we govern; a class of persons Indian in blood and colour, but English in tastes, in opinions, in morals, and in intellect.** To that class we may leave it to refine the vernacular dialects of the country, to enrich those dialects with terms of science borrowed from the Western nomenclature, and to render them by degrees fit vehicles for conveying knowledge to the great mass of the population."

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What is Indian Knowledge System (IKS)

Indian Knowledge System

Indigenous sources of knowledge generated by the Indian society.

✓ **Geographically:** The term 'Indian' points to the undivided Indian subcontinent (Akhaṇḍa Bhārata)

✓ **Demographically:** Those who ought to have been part of the Indian subcontinent, born and lived here for substantial amount of time



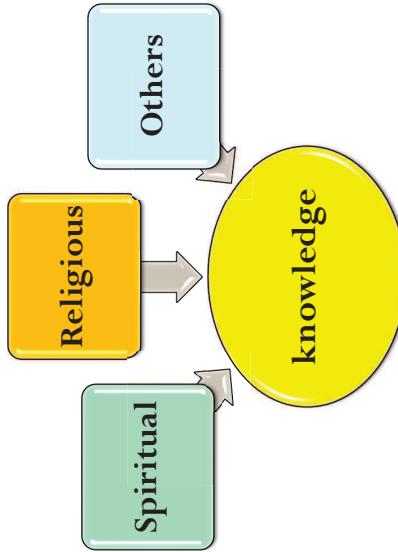
What is Indian Knowledge System (IKS)

Indian Knowledge System

Emanating from the wisdom and insights arising out of deep experiences, observation, experimentation and analysis and validated, improved and augmented further.

✓ **Literary Sources:** Formal repository of knowledge

✓ **Non-literary Sources:** hard to formally study in a structured fashion

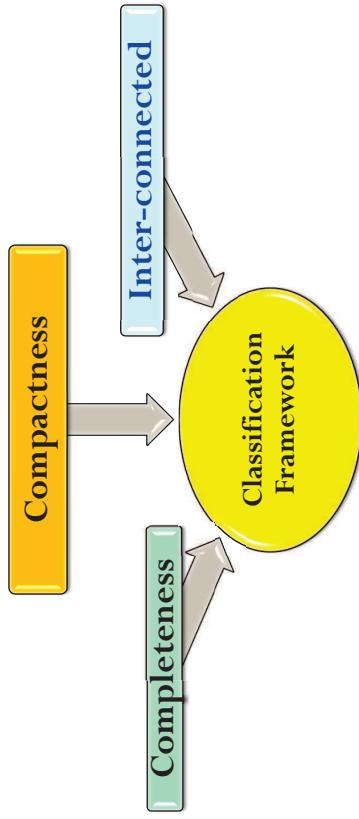




What is Indian Knowledge System (IKS)

Indian Knowledge System

A structured methodology and a classification scheme to access the available corpus of knowledge.



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Multi-dimensional Perspectives Bhagavad Gītā : Religious Angle, or something else?



यदा यदा हि धर्मस्य गतानिर्भवति भारत ।
अन्युथानमधर्मस्य तदात्मां सृजाम्यहम् ॥ 4.7 ॥
yadā yadā hi dharmasya glāmīrbhavati bhārata ।
abhyutthānamadharmaśya tadātmānam् sṛjāmyaham ॥ 4.7 ॥

परित्राय साधुनां विनाशाय च दुःखताम् ।
धर्मसंस्थापनार्थीय संभवामि युगे युगे ॥ 4.8 ॥
paritṛāṇaya sādhūnāṁ vināśāya ca duskr̄tām ।
dharmaśamsthāpanārthāya saṃbhavāmi yuge yuge ॥ 4.8 ॥

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कर्मपयेवाधिकारस्ते मा फलेषु कदाचन ।
मा कर्मफलहेतुभूमा ते संगोऽस्त्वकर्मणि ॥

Karmanyevadhi karaste, Ma phaleshou kada chana
Ma Karma Phala Hetur Bhurmatey Sangostva Akarmani



Multi-dimensional Perspectives
Bhagavad Gita : Religious Angle, or something else?

वासांसि जीणनि यथा विहाय नवानि गृह्णति नरोऽपराणि ।
तथा शरीराणि विहाय जीणन्नन्यानि संयाति नवानि देही ॥२.२२॥

vāsāṁsi jīrṇāni yathā vihāya navāni gr̥hṇatī naroparāṇī ।
tathā śarīrāṇi vihāya jīrṇānianyāni samyāti navāni dehī ॥२.२२॥





Salient aspects of IKS

What is it?

- ❖ Mythology
- ❖ Religious prescriptions
- ❖ Matters of blind faith
- ❖ Science- meta science

Why do we need it?

- ❖ Useful for chanting mantras
- ❖ Mere ‘unqualified’ glorification of the past
- ❖ Will it provide two meals a day for the poor?

Where is it?

- ❖ Almost extinct
- ❖ Incomprehensible
- ❖ Too difficult to cull out

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Why do we need it?

- ❖ Keep it in pooja room & worship
- ❖ Abandon them
- ❖ Take positions without knowing what it contains
- ❖ Glorify the past



Why do we need Ancient Indian Wisdom?

- ❖ Issues of business, government & society
- ❖ God blessed our ancestors too
- ❖ Path dependence

What can we do with Indian Wisdom?

- ❖ Get to know-first hand
- ❖ Explore new paradigms

Protecting received wisdom, economic security, and national pride

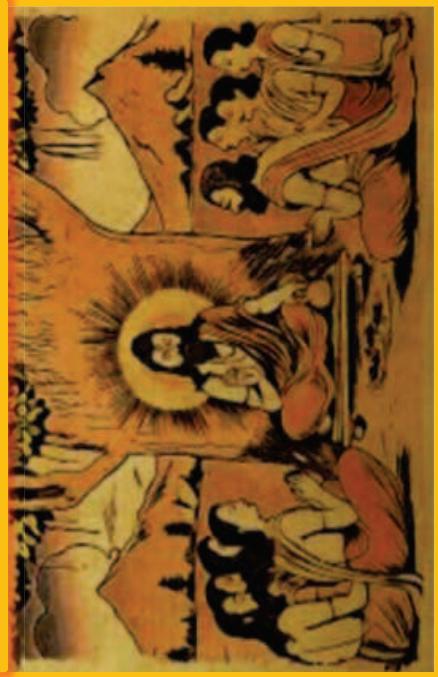
Documenting traditional knowledge, to provide evidence of prior knowledge

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Salient aspects of IKS

The ancient knowledge in India was preserved and transmitted “orally” until a few centuries back



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Historicity of IKS

- ❖ Most of Indian Knowledge System were orally transmitted
- ❖ Dating of the Indian Knowledge becomes conservative, approximate
- ❖ Data to fix the date of the Indian Knowledge of astronomical references

Nuances of an Oral Tradition

- ❖ The entire knowledge is to be transmitted orally and committed to one's memory
- ❖ Need to be concise
 - Verses, Sutras and Mnemonics are very common
 - Unique methods to represent numbers

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Salient aspects of IKS Typical Presentation Style – Sūtras, Encryptions

चतुरधिकं शतमष्ट्युण् द्वाषष्टितथा सहस्राणम् ।
अयुतद्वयविक्रमस्यासनो वृत्तपरिणाहः॥
caturadhikam śatamaṣṭyaguṇam dvāṣṭītathā sahasrāṇām |
ayutadvayavivikramasyāsanno vṛttaparināhah॥

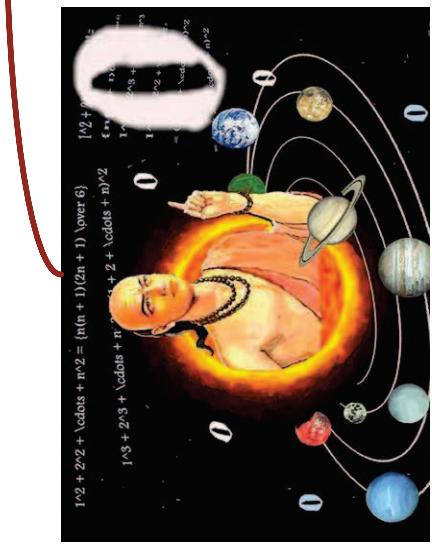
This verse computes the value: $\pi = \frac{\text{Circumference}}{\text{Diameter}} = \frac{62832}{20000} = 3.1416$

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Why do we need IKS?

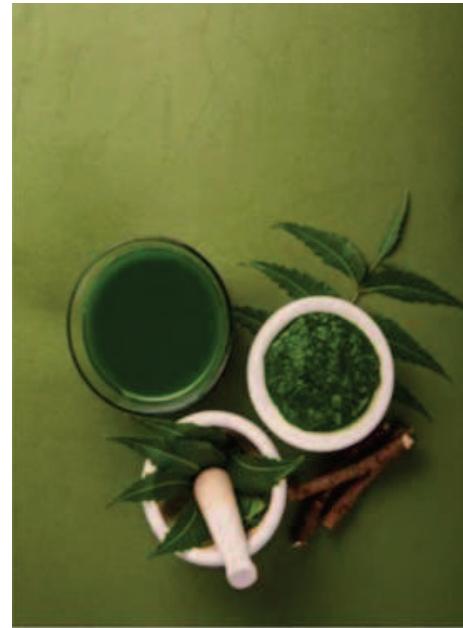


A red curved arrow points from the text "The US company was awarded a patent for neem as a pesticide" to this image.



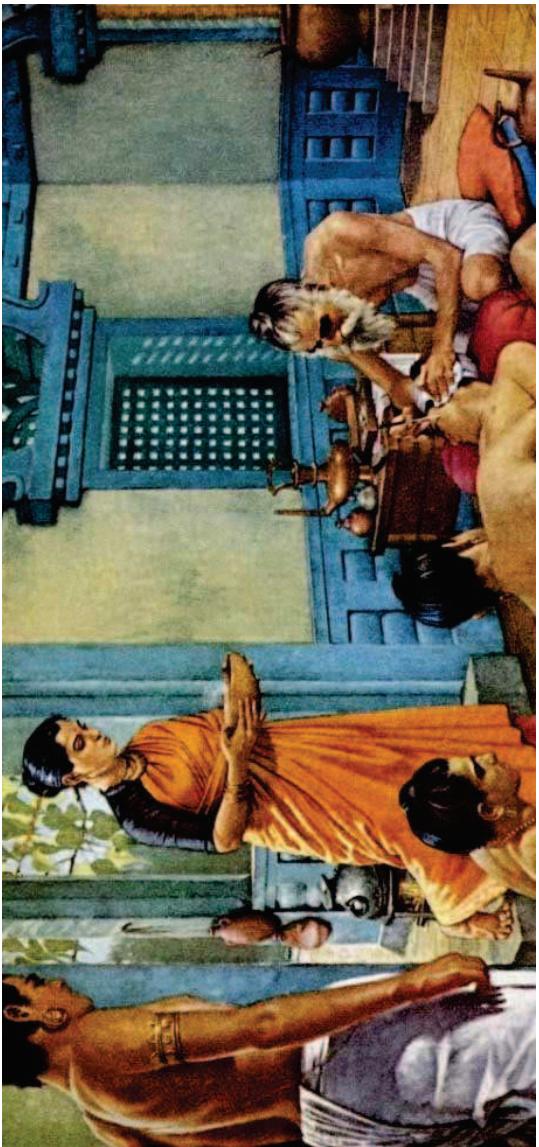
Why do we need IKS?

The US company was awarded a patent for neem as a pesticide





Give name of famous Indian surgeon or neuroscientist?



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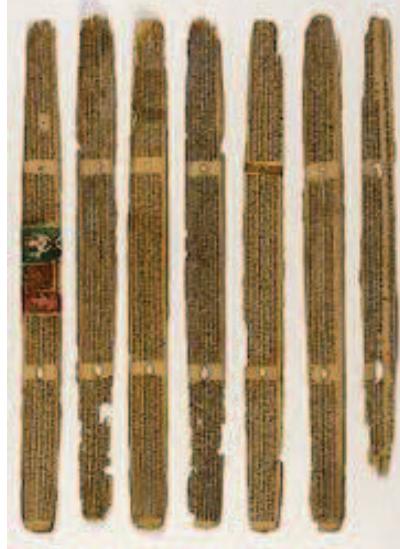
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- 700 and 600 B.C. Susruta –
► Susruta Samhita
► Father of Indian Surgery



A statue of Susruta (600 BCE) at Royal Australasian College of Surgeons (RACS) in Melbourne, Australia



Palm leaves of the Susruta Samhita or Sahottara-Tantra from Nepal, stored at Los Angeles County Museum of Art.

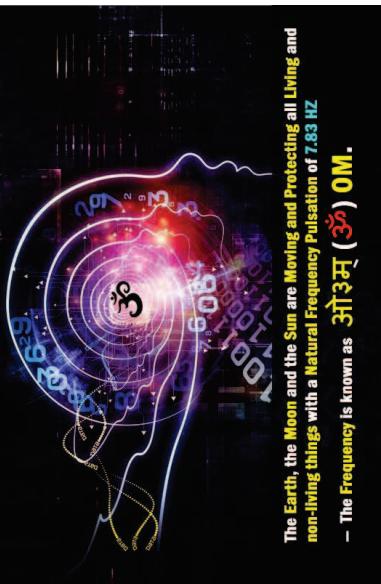
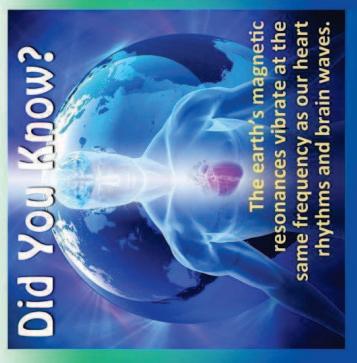
“Two nerves lower down at the back of ear (*vidhura*) which if cut produce deafness; a pair of nerves inside the two nostrils which if cut cause anosmia; a pair of nerves below the end of the eyebrow which if cut causes blindness.”—Susruta Samhita.

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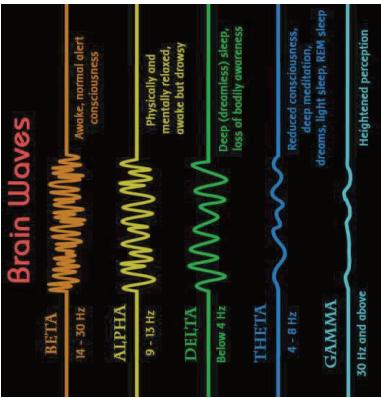
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**"EVERYTHING IN
LIFE IS
VIBRATION"**

– Albert Einstein



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Holistic Development?

आचार्यत् पादमादते पादं शिष्य स्वमेध्या ।
पादं सबहमचारिक्यः पादं काल क्रमेण च ॥

A part we learn from those who teach us,
A part from our own reason's reaches,
A part we learn from friends and peers,
The rest from passing days and years.





Reflection of Ekalavya's spirit of self-learning and dedication:

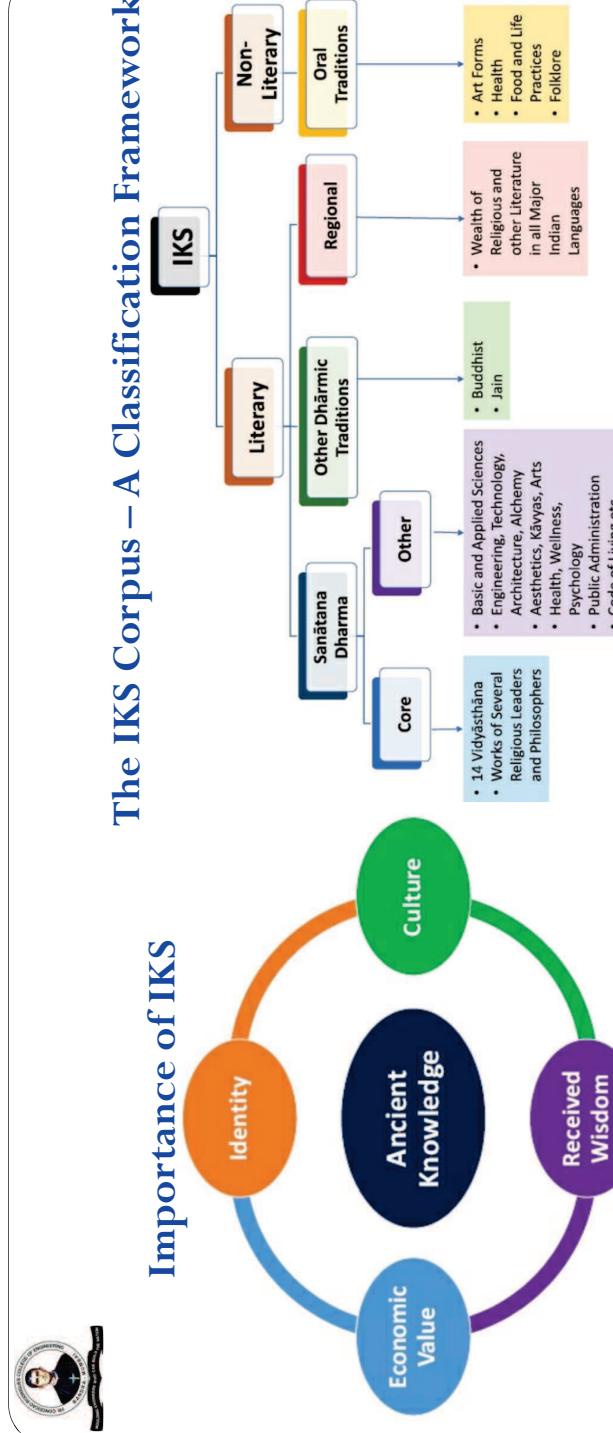


श्रद्धावान् लभते ज्ञानं तत्परः संयतोन्दियः।
ज्ञानं लब्धवा परां शान्तिमचिरेणाधिगच्छति ॥ ३९॥

With faith and dedication, one gains knowledge; with a subdued mind and senses, having acquired knowledge, one attains supreme peace.

A faithful man who is absorbed in transcendental knowledge and who subdues his senses quickly attains the supreme peace.

The IKS Corpus – A Classification Framework



Importance of IKS



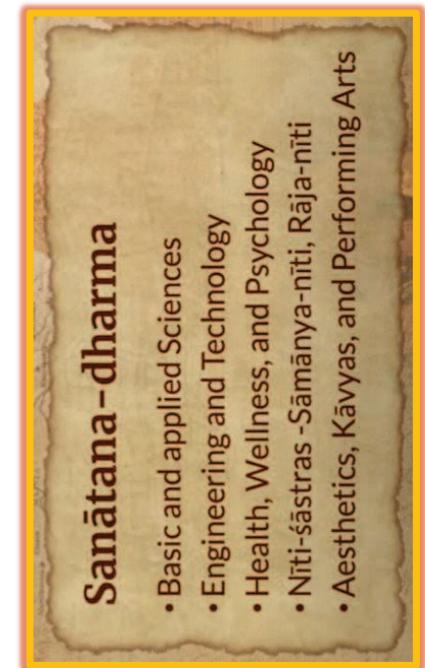


Sanātana-dharma

- Basic and applied Sciences
- Engineering and Technology
- Health, Wellness, and Psychology
- Niti-sāstras -Sāmānya-nīti, Rāja-nīti
- Aesthetics, Kāvyas, and Performing Arts

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Other Dhārmic Traditions

Buddhist works

- Mathematical concepts, maritime activities and alchemy
- The work of Nāgārjuna, Rasarathnākara is an very early contribution to alchemy.

Jain Works

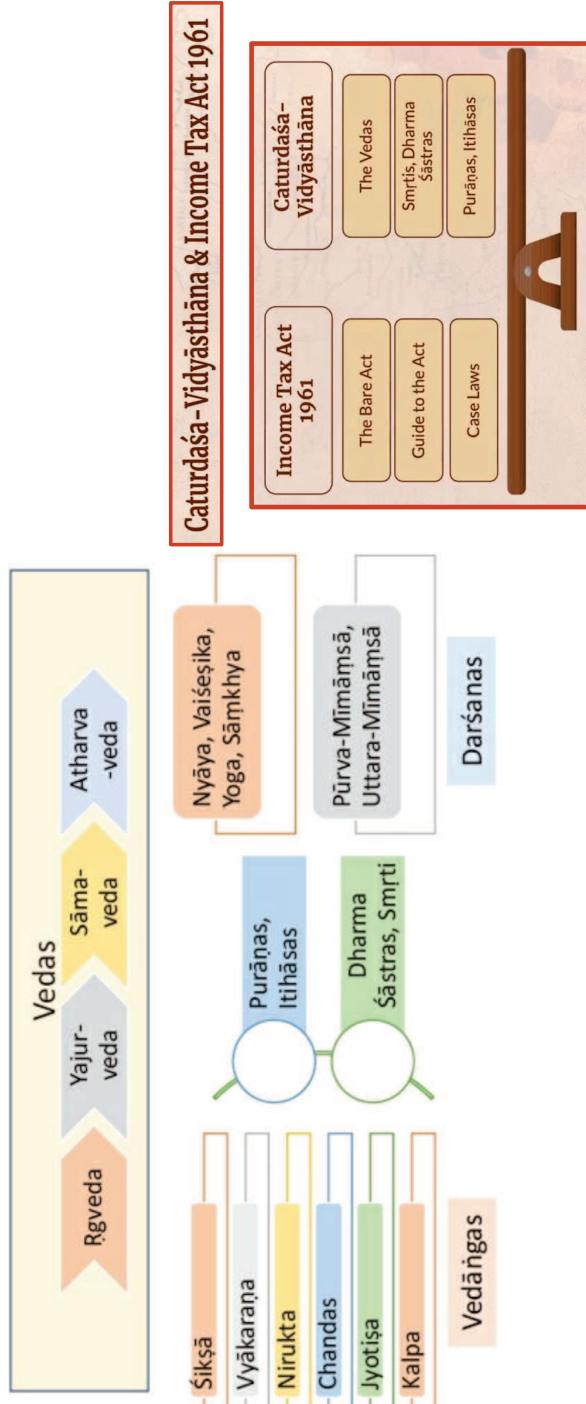
- "Ganitanuyoga"- dedicated to mathematics
- Tattvārtha-sūtra, composed by Umāsvāti
- Anuyogadvāra-sūtra, Vyavahāra-sūtra, and Surya-prajanapati.
- Māhavirācārya's work - Ganita-sāra-samgraha

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A Pictorial Representation of Caturdaśa-Vidyāsthāna



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A Sample List of the IKS Repository

Excavations (@Dwarka)

Sl. No.	Name of the Work	Keyword 1	Keyword 2
1	Vedas	Before 3,000 BCE	
2	Purāṇas*	Dharma (Code of Living)	Several Other Topics
3	Mahābhārata, Rāmāyaṇa	3,000 BCE to 500 CE	
1	Vedaṅga-jyotiṣa	Astronomy	
2	Manu-smṛti	Public Administration	Dharma (Code of Living)
3	Śūla-sūtras	Mathematics	Dharma (Code of Living)
4	Sūṣruta-saṃhitā	Health	Wellness
5	Aṣṭadhyāyī, Nirukta	Linguistics	Grammar
6	Nāṭyaśāstra	Art Forms	Dance, Theatre
7	Buddhist Texts	Philosophy	Mathematics
8	Nyāya and Vaiśeṣika Sūtras	Logic, Epistemology	Knowledge Framework
9	Iālina Mathematical Works	Mathematics	Mathematics
10	Arthaśāstra	Public Administration	Finance, Foreign Policy
11	Chandah-sāstra	Metrical Pattern, Prosody	Binary Maths Ideas
12	Yoga-sūtras	Control of Mind	Philosophy
13	Kamasūtra	Art Forms	Dharma (Code of Living)
14	Maha-bhāṣya	Sanskrit Language	Grammar
15	Rasaratnākara	Alchemy	Alcherry
16	Caraka-saṃhitā	Health	Wellness
17	Śāṅkhya-darśana	Philosophy	Psychology
18	Amarakōṣa	Linguistics	Lexicography
19	Surya-siddhanta	Astronomy	Mathematics
20	Bṛhat-saṃhitā	Astronomy, Mathematics	Several Other Topics

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Beginning of recorded history as per west upto fall of Roman Empire
Rich repository cutting across several disciplines of knowledge

Dark ages as per modern parlance



Sixty-four art forms (64 Kalās)

- ❖ Kalā is defined as that *which makes an individual happy and is an art form*. The word ‘art form’ in the context of ‘Kalā’ has a wider meaning as it does not restrict itself only to performing arts.
- ❖ The list of 64 *kalās includes a wide range of engineering and technical skills.*

No.	Type of Skills
1	Artistic Skills: Singing, dancing, painting, theatriacs, playing instruments, etc.
2	Skills in Cleaning and Beautifying Body: Dressing decorating, painting the face, applying aromatics, combing hair, setting ornaments, etc.
3	Skills of Decoration: Making a covering of flowers for a bed, making the groundwork of jewels, covering the bed, applying an admixture of colors, etc.
4	Cooking Related Skills
5	Play and Entertainment Skills: Playing on music in water, splashing with water, juggling, playing with thread, riddles, gambling, using children's toys, etc.
6	Skills for Intellectual Pursuits: Conversation, practicing language, composing, designing a literary work, lexicography and metres, reciting books, etc.
7	Engineering and Technical Skills: Needle works and weaving, spinning, carpentry, engineering, testing silver and jewels, metallurgy, mineralogy, practicing medicine, mechanics, etc.
8	Special Uncommon Skills: Knowing the mode of fighting of lambs, and birds, knowing conversation between male and female cockatoos, talking with fingers, prediction by heavenly voice, etc.

Moulding Engineers Who Can Build the Nation

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Vowels

अ	a	उ	ु	ॄ	ि	ौ	ो
आ	ā	ऊ	ū	ॄॄ	ि	ौौ	au
े	i	ऋ	r̥	ঃ	e	ঃ	ɛ/ə
ু	ি	ঔ	t̥	ঃ	ɛ	ঃ	ɛ/ə

Consonants

କ	ka	କ୍ଳ	ca	ଟ	ତା	ତ	ତା	ପ	ପା
ଖ	kha	ଖ୍ଳ	cha	ଠ	ଥା	ଥ	ଥା	ଫ	ଫା
ଗ	ga	ଗ୍ଳ	ja	ଙ	ଦା	ଦ	ଦା	ବ	ବା
ଘ	gha	ଘ୍ଳ	jha	ଙ୍ଗ	ଧା	ଧ	ଧା	ଭ	ଭା
ଙ୍ଗ	ṅa	ଙ୍ଗା	ଙ୍ଗା	ଣ	ନା	ନ	ନା	ମ	ମା

Others

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ಖ್ಯಾತಿಗಳನ್ನು ಮಾಡಲು ಅವರಿಗೆ ಸಹಾಯ ಮಾಡಿದರೆ ಅವರು ತಿಳಿಗೆ ಹೇಳಬಹುದು. ಈ ಕಾರಣಕ್ಕಾಗಿ, ನಿನ್ನ ಪ್ರಾರ್ಥನೆಯ ವರದಿಯಲ್ಲಿ ಅವರಿಗೆ ಸಹಾಯ ಮಾಡಿದರೆ, ಅವರು ತಿಳಿಗೆ ಹೇಳಬಹುದು. ಈ ಕಾರಣಕ್ಕಾಗಿ, ನಿನ್ನ ಪ್ರಾರ್ಥನೆಯ ವರದಿಯಲ್ಲಿ ಅವರಿಗೆ ಸಹಾಯ ಮಾಡಿದರೆ, ಅವರು ತಿಳಿಗೆ ಹೇಳಬಹುದು.

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