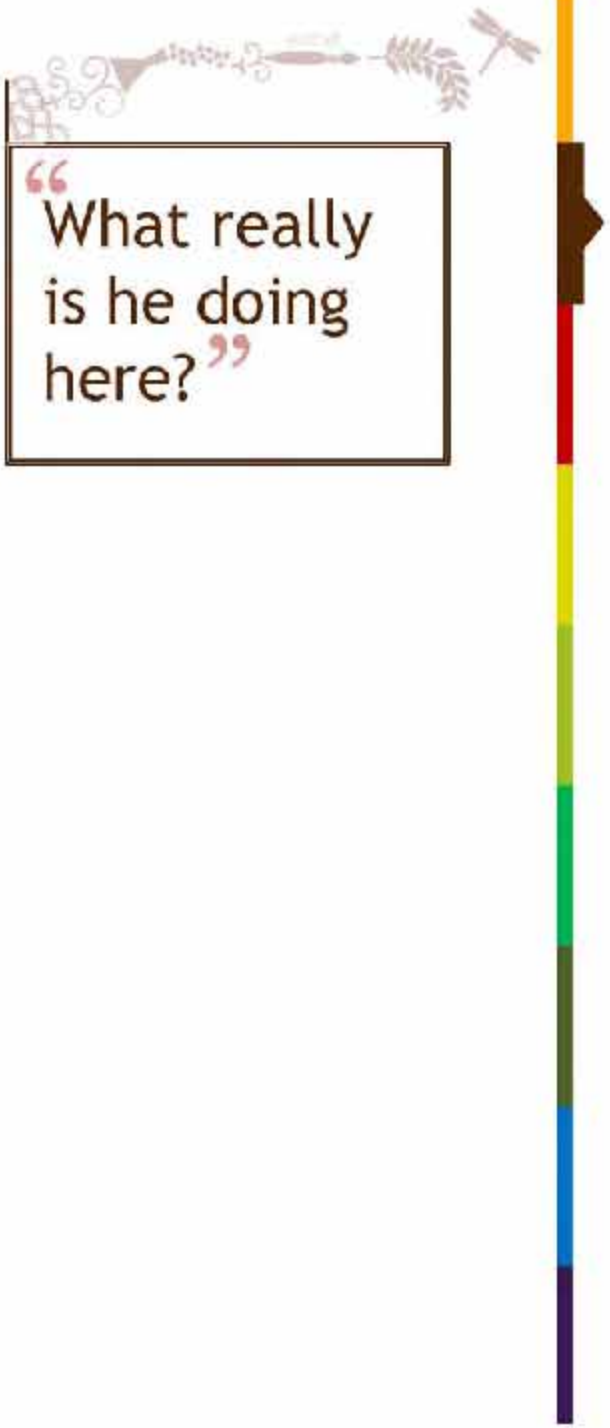
Teaching-Learning Resources in the Indian Context: Yes it's possible!

Tejas Joshi

At the Second International Conference on Education in Chemistry (ICEC), Mumbai, India

December 14, 2014 | 9.50 a.m.


“What really is he doing here?”

"What really is he doing here?"

A simple start

2009

A B.Sc. student

Fascinated by well-illustrated books and animations that made life simpler

Got selected into this NIUS programme

Ta-daa! HBCSE: **Were there centres for Science Education too?!**

"What really is he doing here?"

A simple start

2009

2010

(struggled)
started a project
on the Biginelli
Multicomponent
reaction

A very different
experience

Opened me up to the world
of Science Education and
it's importance
(and work at HBCSE)

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⇧

⇨ Attended
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Severely stung by the Chemistry Education bee!

Attended
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"What really is he doing here?"

A simple start

2009 2010 **2011**

The International Year of Chemistry (IYC)

Chemistry was really being celebrated everywhere!

And we tried something in college too

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Stung by the Communication bee!

"What really is he doing here?"

A simple start

2009 2010 2011 **2012**

Majored in Chemistry

Decided to take some time before a Masters course

Got back here!

"What really is he doing here?"

A simple start

2009 — 2010 — 2011 — **2012**

Majored in Chemistry

Decided to take some time before a Masters course

Got back here!

This talk describes the small project we undertook

Guess that 'poster' put up in every classroom or laboratory?

That dull thing students dread and refuse to study, and yet are forced to hang in a corner at home: *only with the hope that some of the mammoth data it contains will be retained!*

Guess that 'poster' put up in every classroom or laboratory?

Yes! The periodic table!

That dull thing students dread and refuse to study, and yet are forced to hang in a corner at home: *only with the hope that some of the mammoth data it contains will be retained!*

The starting point

What we attempted

To enthuse and engage students, specially at high-school, with the periodic table and the elements

To try discussing and portraying the table in a slightly different perspective

To introduce a component of history, yet not be endlessly long

To create some 'resource' that doesn't feel like just another periodic table poster, but feels special and memorable

The starting point

Why we attempted

A frequently re-visited concept from high-school onwards

A beautiful example depicting nature's architecture and human endeavours to decode it, and the corresponding evolution of Chemistry

Students only look at it as a ready-made table, without appreciating its development

They hardly spend time with it (apart from cramming the technical details)

The starting point

Some resources in the print medium

How we attempted

Content of the resources could act as a starting point for the reader to *explore more*

Compact and cost-effective: in the Indian backdrop, without compromising on the content

Visually appealing

Linguistically simplified

June 2013

The first outcome

A folded booklet- '**flyer**': discussing the milestones in the development of the periodic table

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The first outcome

Begins with the notions about elements in the ancient times

The rise of experimental science

Introduction to scientists instrumental in this development, and their contribution

Some historical anecdotes

Issues surmounting the discovery of new elements, and their resolution

The first outcome

Opens into a small activity

A folded booklet- ‘flyer’: discussing the milestones in the development of the periodic table

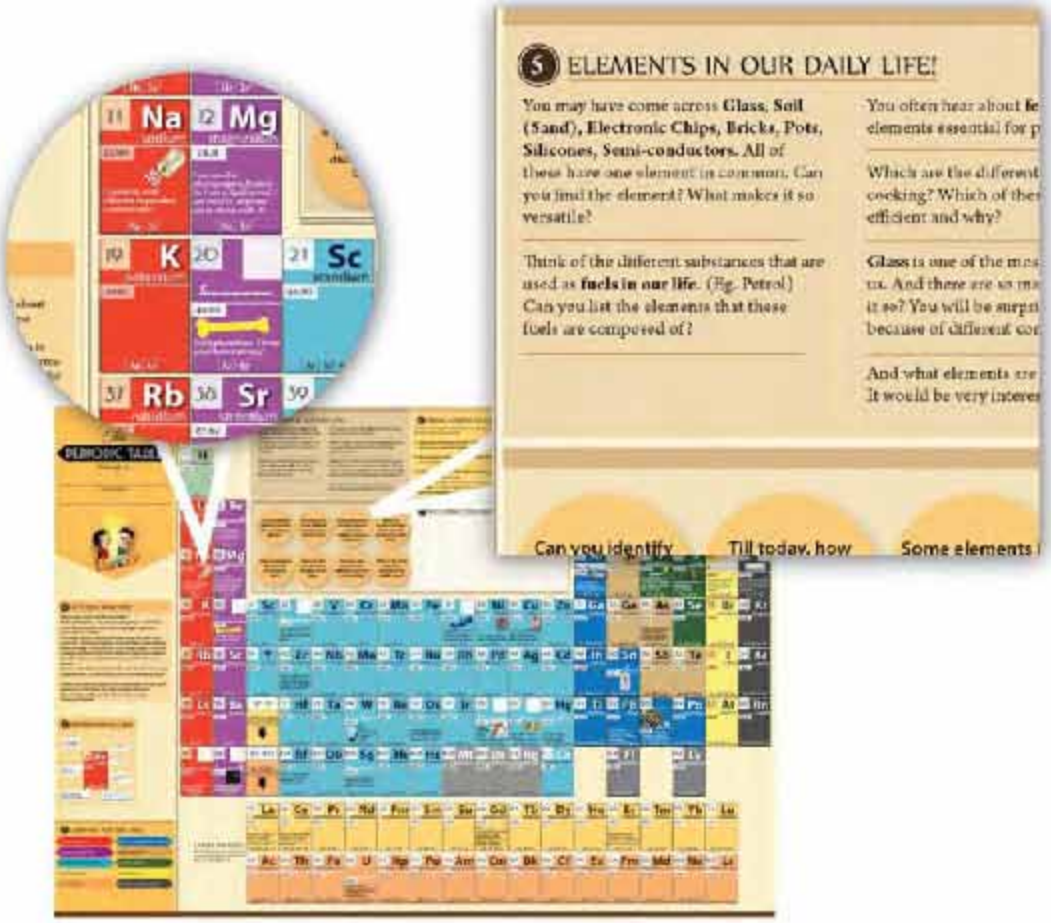
Begins with the notions about elements in the ancient times

Incorporates some historical anecdotes

Introduces scientists instrumental in this development, and their contribution

The first outcome

Opens into a small activity



The first outcome

An incomplete periodic table, with clues and hints that the reader can fill up

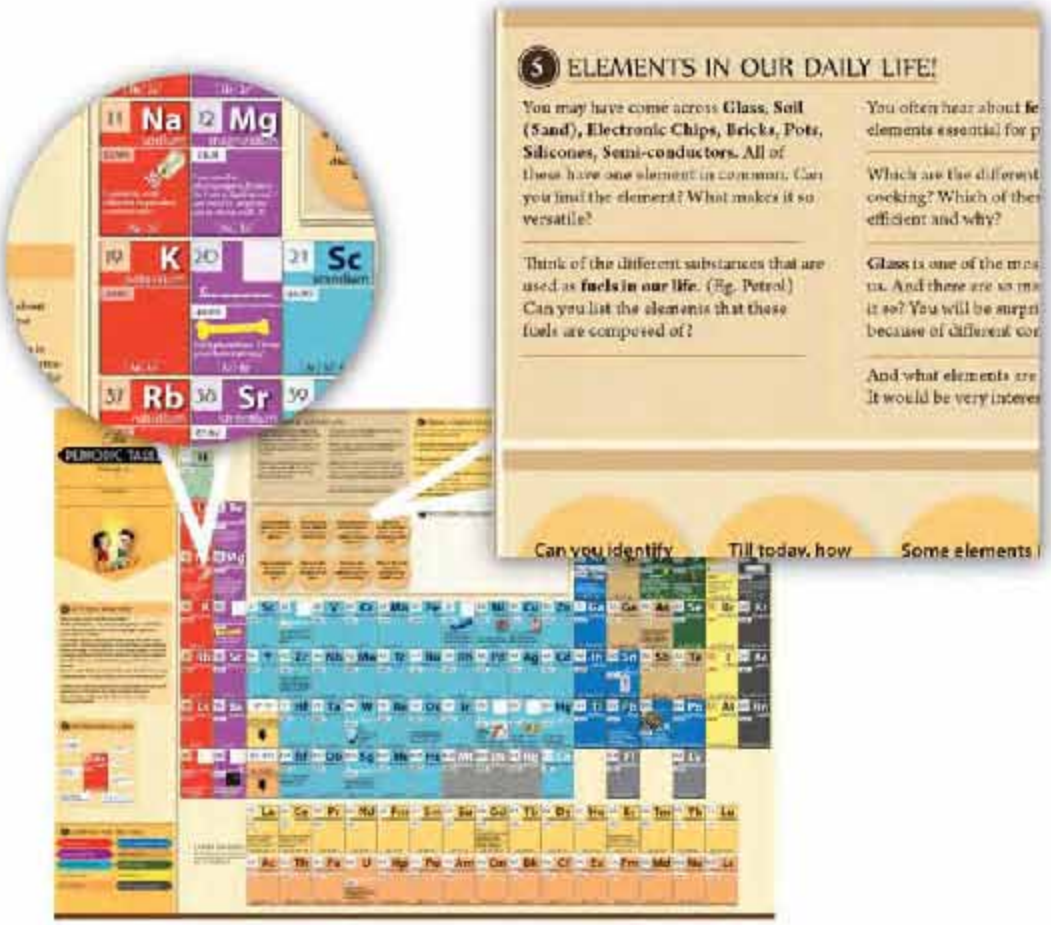
Questions from everyday life

After filling the table, some reflection questions on the table

Place to note your own questions

Some resources to refer

Opens into a small activity



June 2013

This gave us a direction

Designing the activity in the first flyer led us to explore the elements next

Sept. 2013

The second outcome

A pack of 114 visual cards, one for each element

Sept. 2013

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The second outcome

A pack of 114 visual cards, one for each element

Not the conventional flash cards

Sept. 2013

The second outcome

A pack of 114 visual cards, one for each element

Attempt to introduce elements to the reader in an *atypical* way

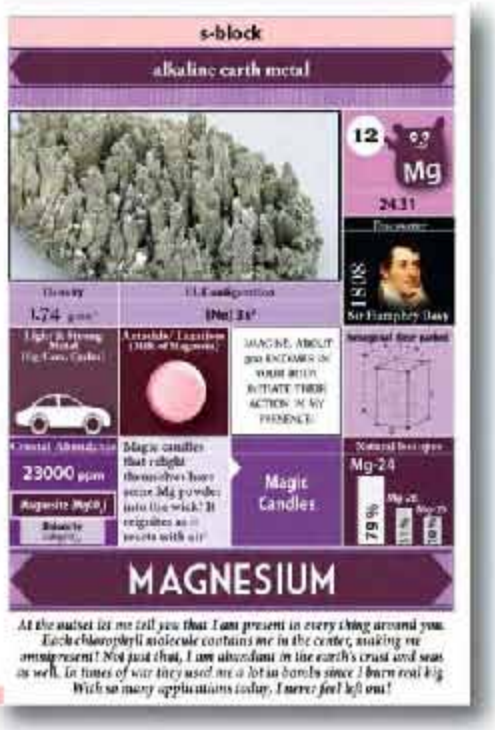
The cards

The element introduces itself

Contextualization to everyday life

Color-schemed and illustrated

Front Face



The element does the talking!

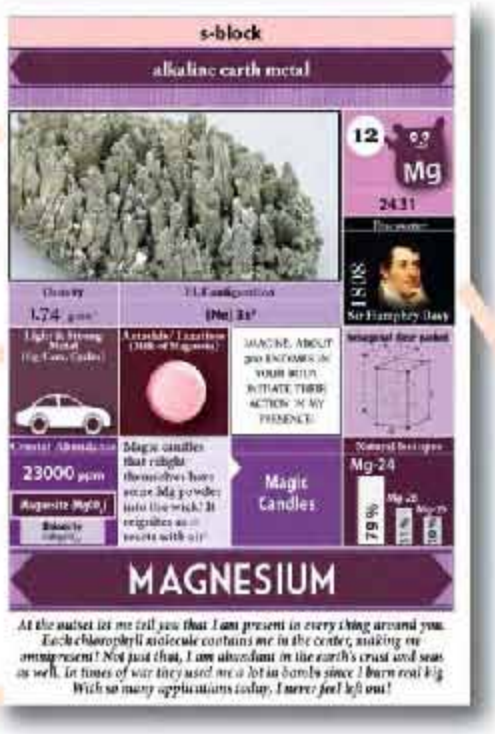
The cards

Front Face

Open-source photograph of the element

Application based visual tiles

The element does the talking!



Discoverer of the element

The cards

Front Face

Color-code, block and category of element

Open-source photograph of the element

Application based visual tiles

Discoverer of the element

The element does the talking!

The cards

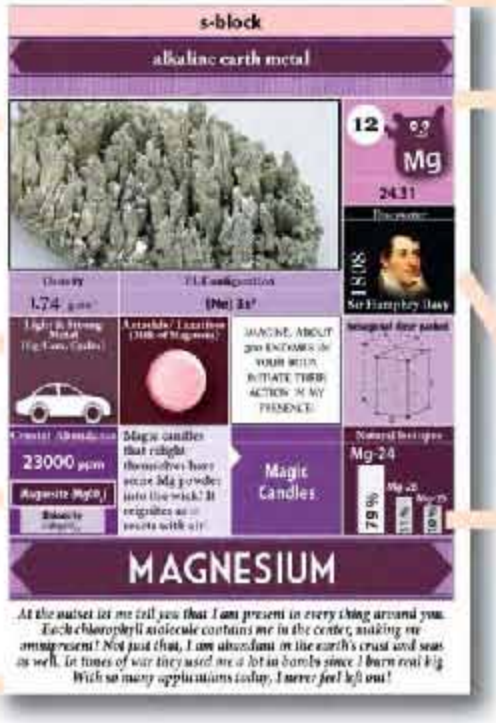
Front Face

Open-source photograph of the element

Application based visual tiles

Crustal abundance and minerals

The element does the talking!



Color-code, block and category of element

Technical Information: Eg. density, electronic configuration

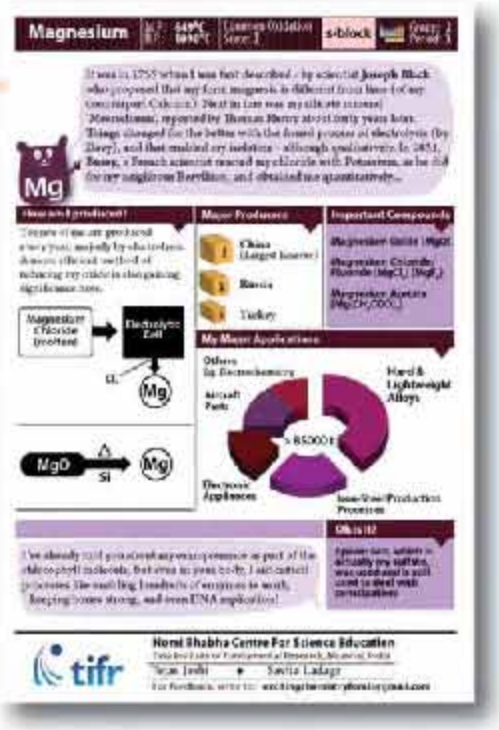
Discoverer of the element

Natural isotopes

The cards

Back Face

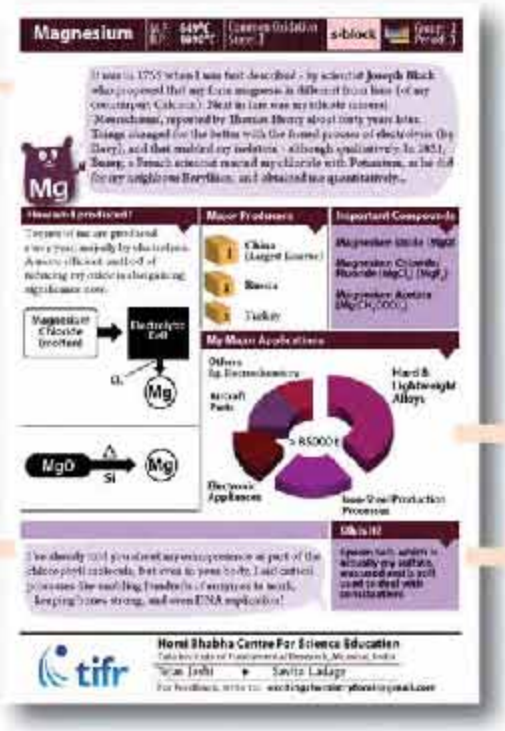
Story of Discovery of the element



The cards

Back Face

Story of Discovery of the element



Major applications/ outlets for the element

Biology and environmental anecdotes

Interesting tidbits about the element

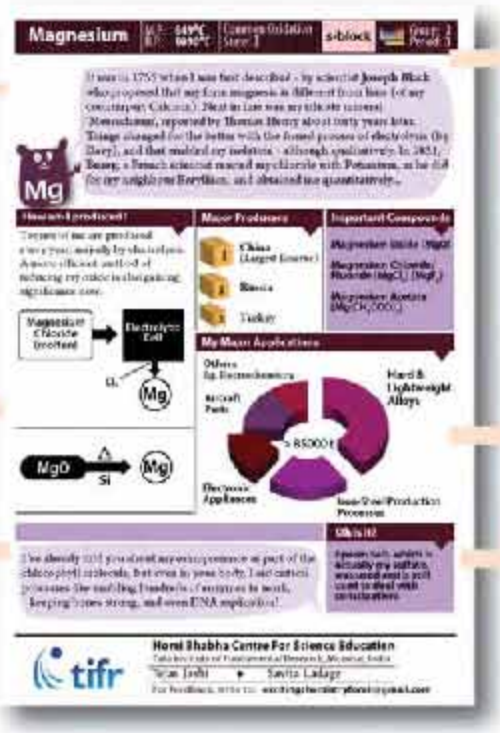
The cards

Back Face

Story of Discovery of the element

Production and compounds of the element

Biology and environmental anecdotes



Technical Information: Eg. Physical constants, placement in the table

Major applications/ outlets for the element

Interesting tidbits about the element

The cards

Photographs

The box encloses a small ‘Start here’ booklet and ‘What’s that photograph?’ directory

Jan. 2014

By now…

Doing this part opened us up to an array of resources available in a variety of media

Thus, the need to share and propagate this compilation

Could those who couldn't avail our prepared material still be able to access this?

Sharing this kind of a project

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Sharing this kind of a project

The internet could address some of these

March 2014

Exploring the internet medium

Creation of a set of webpages for the project
www.letsmeetthechemicalelements.org

March 2014

Exploring the internet medium

Creation of a set of webpages for the project ***www.letsmeetthechemicalelements.org***

Acts as a compilation of resources on the periodic table and elements

Describes the project in detail, for a prospective executor

The entire flyer is now available for anyone to read and share on the site (cards to follow)

About the pages

- Easy to load
- Basic HTML and CSS structure
- Compact layout to aid mobile devices
- A good destination to house a detailed feedback form

Feedback

Students welcomed:

- The visual component
- The way the element 'talked' to them
- For once, Chemistry felt good to hold

- "I never knew that ___ was such an important element"

- "We normally learnt about Dobereiner, Newlands and Mendeleev, but not about other scientists"

- "I didn't get to see all elements, so this idea is nice"
- "I wish our books were so colorful!"

Feedback

Teachers/ Educators said:

"I really enjoy seeing work in the types of Chemistry Education done internationally. The work you've done is really interesting and practically useful"

"Very nice initiative. Would be interested in learning its effectiveness once you have some data"

"This work is very well done , and I can see how this will capture the interest of students of all ages. It is a fabulous resource that can have a great impact on student learning"

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More

The project was accepted for presentation at the IUPAC International Conference on Chemistry Education in July 2014
(and a poster award too)

A very encouraging response at the ICCE and BCCE

'Unterricht Chemie', a German journal of Friedlich Verlag included this work in the special issue on the chemical elements (Issue 143, July 2014)

Let us try!

Let's take this project as an example and see how to go about creating any material

Teachers

Students

Let us try!

?

Let us try!

The reason

An area of trouble you want to address

Let us try!

Let us try!

The idea

How you wish to address the issue, what ideas

Let us try!

Let us try!

Who all, and for whom?

Alloting the work, deciding the audience

Let us try!

Reviewing what is already there

A great context: helps us decide better

Let us try!

What medium? What form factor?

Or a combination?

Let us try!

Let us try!

Economics

How to manage costs?

Let us try!

Preparing a detailed plan

Every big and small detail

Let us try!

Let us try!

Planning a timeline

How much time can you allot for this? Spaced over what phases?

15m

Let us try!

Preparing the resources

A first draft, finalization, readying the final outcome

Let us try!

Feedback

From experts

From teachers

From students

Outreach

Why?

Place for improvement, always

For our project, for example:

Translation to regional languages

Detailed Feedback form

Writing on more themes

Enhancing availability

Continuous review, tend towards improvisation

Why?

Why do this, really?

For the teacher:

- A rejuvenating and creative experience
- A way to connect and engage with the students
- A means to update knowledge
- A possibility to teach

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For the student:

- The joy of creation and ownership
- Developing different perspectives
- Understanding the role of Chemistry in their life
- The very important tool of communication
- Satisfaction of the geeky soul
- Makes them responsible

Inspiration

'Nature's Building Blocks' by *John Emsley*

Theodore Gray, and his awesome work on the elements! Photographs, the card deck, and that unbelievable element vault!

Bassam Shakashiri and his rigorous 'Chemical Demonstrations' volumes

The *Royal Society of Chemistry's* 'Learn Chemistry' portal (naturally!) Resources cannot get more exhaustive than this

The *Journal of Chemical Education*
(Yes I seem to represent that 3 %, Norb!)

Wikipedia- a great example of knowledge sharing

University of Nottingham's Periodicvideos.com

Kevin Dunn's 'Scientific Soapmaking' workshops

Patricia Hill's art-infused workshops- These are mindblowing

The Jmol and ChemCollective project

Arvind Gupta and his extensive collection of resources

Thank You

V.G. Vaze College, Mumbai

Jayashree Ramadas, Chitra Natarajan,
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Kelly Butler, Julie Henderleiter, Ilka Parchmann

Unforgettable learning

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