Exploring Possibilities of Cooperation Between NCERT and Korea for Qualitative Improvement in Learning Science and Mathematics through Development of Tools (Kits) and Techniques

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Outline

- About our Division- ‘Division of Educational Kits (DEK)’
- Learning Science/Mathematics through kits??- ‘Minds On-Hands On’
- Development of the Science and Mathematics kits- Prior to 2005
- Development of the Science and Mathematics kits- 2005 to 2012
- Development of the Science and Mathematics kits- 2012 to 2015
- Future Plans- 2016 Onwards
- Possible areas of Collaboration!

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Division of Educational Kits (DEK)

- Division of Educational Kits (DEK), previously known as National Institute of Education-Workshop was conceived in 1964.

- DEK provides academic assistance for designing and developing of Science/Mathematics equipments.

- The division has developed both **Science and Mathematics Kits** for **Primary, Upper Primary, Secondary and Higher Secondary stages**. These kits describe and elaborate an important and effective pedagogical strategy and thus, promote active engagements in subjects.

- The division orients Key Resource Persons of SCERTs/SIEs/RMSA/SSA about the production, use and integration of the kits in classroom processes. These trained Key Resource Persons further orient the teachers in their states about the preparation and use of these kits.

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➢ **The National Curriculum Framework (NCF)-2005 position paper on teaching of Science supported by a large body of research on Science Education – Recommends a pedagogy that is Hands-On.**

Many Names: One Concept

- Hands-On Activities
- Activity Based Learning
- Experiential Learning
- Learning by Doing

The idea of such 'Activity-Based Learning' is rooted in the common notion that children are active learners rather than passive recipients of information

If child is provided the opportunity to explore by his own and provided an optimum learning environment then the learning becomes joyful and long-lasting

Doing an activity will be more meaningful and insightful than talking or reading about it in class

For learning Science concepts through above-mentioned approach, we have developed **Science kits** for all the stages

One of the MOST Significant recommendations of the National Curriculum Framework (NCF)-2005

Mathematisation of Child's thought processes

In achieving this goal, concrete mathematical experiences play a major role!

- For learning mathematics concepts through above-mentioned approach, we have developed **Mathematics Kits** for various stages.

- The kits broadly cover activities in the areas of geometry, algebra, trigonometry and mensuration etc.

We have developed both the Science and Mathematics kits for various stages, keeping in mind the following goals:

- Portability from one place to other
- Availability of necessary materials at one place
- Multipurpose use of items
- Economy of time in doing the experiments
- Low-cost/no-cost material and use indigenous recourses
- Provision for teacher's innovation

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Development of the Science and Mathematics kits- Prior to 2005

- **The Primary Science Kit (PSK)** and **Mini Tool Kit (MTK)** were developed by the NCERT and were included in the list of essential facilities for the Primary schools under the centrally sponsored Operation Blackboard (OB) Scheme.

- In 1970s, after having developed a prototype, the NCERT sent PSK to all the States and UTs. A number of States and UTs begun to manufacture PSK on the design of the NCERT prototypes.

- Prototypes of the **3-D Molecular Model Kit** for Chemistry for higher secondary level were developed and tried out in the actual classroom situation.

- A **Chemistry Kit** for the Open School System at higher secondary level was also developed by NCERT.

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Development of the Science and Mathematics kits- 2005 to 2012

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1. Upper Primary science Kit (UPSK):

- The Upper Primary Science Kit along with its manual has been developed based on the science textbooks developed by NCERT in the light of NCF-2005.
- It offers scope for more than 200 activities as outlined in the kit manual.
- The kit contains more than 130 scientific equipment and general items, chemicals, glassware, etc

2. Secondary Science Kit (SSK):

- The provides scope for various learner-centred activities on the chapters of science textbooks for Classes IX and X based on syllabus developed in the light of NCF-2005.
- By using this kit laboratory experiments prescribed by CBSE for IX and X can be done. It is a complete portable laboratory. The kit contains more than 107 scientific and general items, chemicals, glassware, etc.
- There is a special provision to use the microscale chemistry lab technique, which reduces hazards, the wastage of chemicals, thus making it environment friendly.

3. Senior Secondary Microscale Chemistry Laboratory Kit (SSMCLK)

- Reduces chemical waste by schools and students learn waste minimization techniques.
- Minimises health risks to students and teachers in the school laboratories.
- Reduces cost of materials.
- Saves time for preparation.
- Need smaller storage area.
- Reduces reliance on intensive ventilation systems with a significant reduction in electricity and water consumption.
- This microscale chemistry laboratory kit has been designed to replace the traditional chemistry laboratory.
- One kit may be used by four students as it has rotatable top to hold reagent bottles.
- It has 43 items. It is accompanied by a detailed manual describing the use of items and details of each experiment.

4. Solid State Model Kit (SSMK)

- The kit consists of a plastic moulded platform, dowels and PVC hollow balls of two different diameters.
- On the top side (A) of the platform, holes are made at the vertices and centre of regular hexagons. These holes show the positions of atoms in a unit cell.
- These holes can receive friction fitting dowels by which the number of crystal structures can be clearly visualized and understood.

5. Molecular Model Kit (MMK)

- The kit enables the students to explore the structure of simple organic, inorganic molecules and solids.
- This self-learning kit contains various plastic moulded atoms having a number of prongs and shapes in various colours. The colours have a typical meaning according to International Colour Code, but the users can make a colour mean whatever they like if needed.
- Prongs are used to make bonds to other atoms through tubing. The kit can be used to make models for most of the molecules as discussed in the XI and XII NCERT textbooks.

6. Upper Primary Mathematics Kit (UPMK)

- This kit has been designed to enable the students to do various activities for learning mathematics concepts at upper primary level.
- The items include cubes, strips, cutouts of various shapes, an innovative geoboard, abacus, etc.

7. Secondary Mathematics Lab Kit (SMLK)

- Using this kit, different types of activities for learning concepts of mathematics at secondary stage can be carried out.
- This kit consists of 20 items include strips A and B type, cutouts with cuboid of various shapes, an innovative geoboard, Trigonometric Circle Board, Pythagoras Theorem Square with 5 cutouts, Algebraic tiles, etc.

8. Secondary Science Lab Kit (Biology)

- This kit consists of more than 40 items.
- It helps in carrying out prescribed experiments related to the theme 'The World of Living' in the Laboratory Manual.

9. Secondary Science Lab Kit (Physics)

- This kit helps in carrying out experiments prescribed at classes IX and X under the theme 'Moving Things, People, Ideas, and Natural Phenomenon and How Things Work'.
- It consists of more than 50 items.

10. Secondary Science Lab Kit (Chemistry)

- This kit consists of more than 40 items.
- It enables the students to do experiments using microscale chemistry laboratory techniques related to the theme 'Materials at Secondary Stage'.

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Development of the Science and Mathematics kits- 2012 to 2015

- In 2012-13, our new Division *i.e.* DEK was created and since then, we have developed educational kits for other subject areas also.

- **In the recent year 2015-16, the following new kits are developed:**

- **Higher Secondary Physics Lab Kits**
- **Higher Secondary Biology Lab Kits**
- **Higher Secondary Mathematics Lab Kit**

All the kits are accompanied with a detailed manual describing the use of items and details of each experiment.

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Future Plans-2016 Onwards!

- **It is proposed to develop some theme based low-cost take-home kits for Science and Mathematics.**

- **In collaboration with IIT Delhi and some NGOs, we are intending to develop Science and Mathematics kits for the visually impaired students.**

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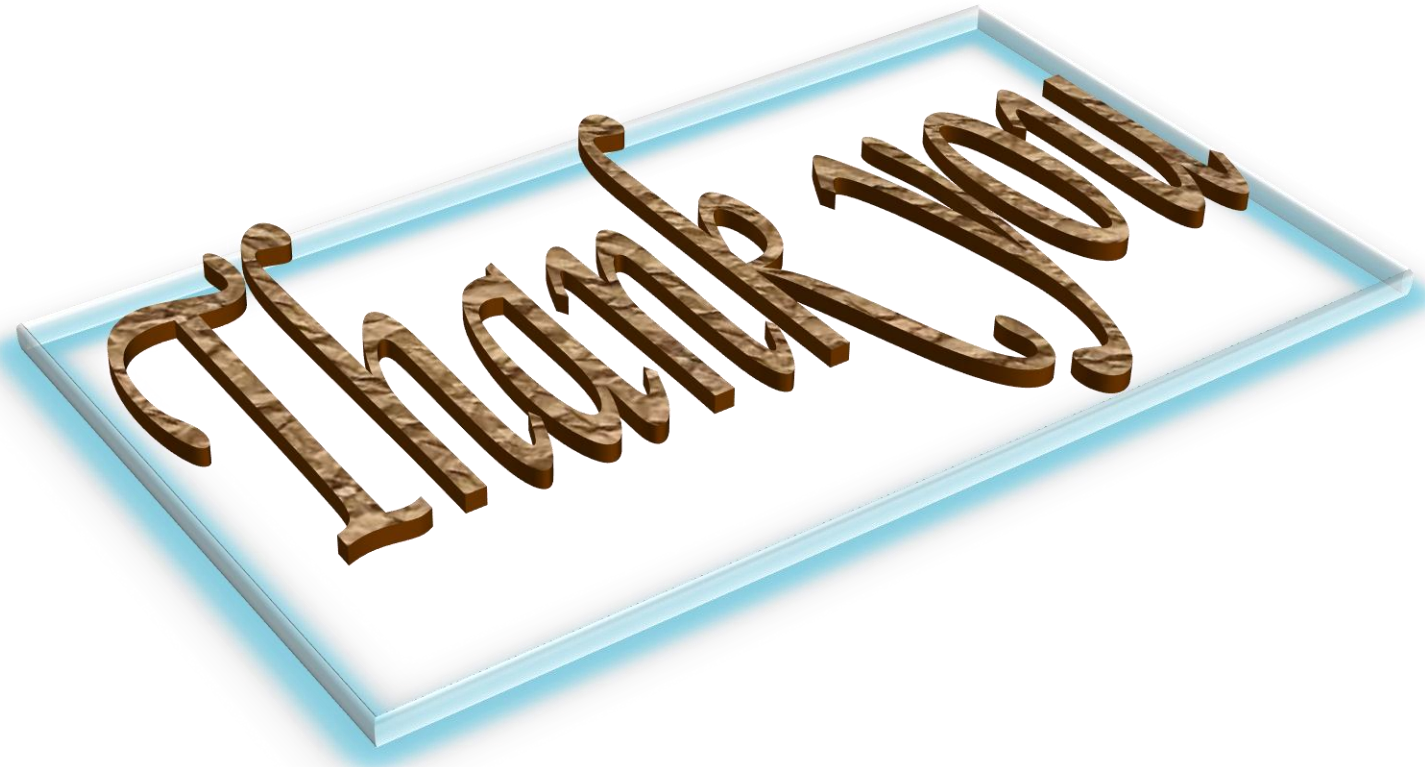
- **Possible areas of Collaboration!**

Possible Areas of Collaboration!

- Designing of low cost kit items

- Low cost technology to manufacture kit items at large scale, 3D printing, tactile printing and rapid prototyping

- Establishment of quality control laboratory for verification of specifications of kit items


Thank You