Enhancing 'Music: What it means?' LU teacher notes through pedagogic interactions & feedback

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Introduction: Vigyan Pratibha Learning Units (LU) are modules on topics closely related to school curricula, but expose students to wider dimensions of science and mathematics. The teacher version of LUs have additional notes to help teachers facilitate these units in class. LUs are constantly reviewed: teachers' feedback in workshops, learning from practice sessions at school and reflections are used to enhance its contents. During the pandemic, we conducted Vigyan Pratibha online Discussion Seminars (VPDS), for teachers to dicuss various LUs. To date, 100+ sessions are conducted and over 150 teachers have participated in it. The present work is an attempt to share how discussions on **'Music: What it means?'** LU were studied in a team, with an objective to enhance LU content and prepare teacher notes.

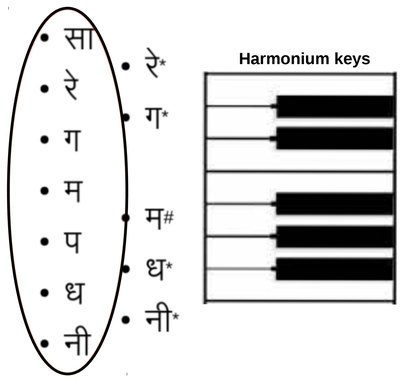
Musical Background

Interaction during session

Instructor provided a brief introduction about basics of music for novices

Reasons articulated

- Science teachers discussed hesitation to conduct this LU thinking they had no background knowledge of music.
- This LU can be conducted with the help of the music teacher, but getting some familiarity between concepts of science and music can be helpful.



12 musical surs : 7 are white keys, remaining 5 are black keys.

Enhancing the LU content

- Definition of terms common in Music & Science (volume, pitch, note, tempo) in teacher notes.
- Devnagri versions of musical terms (Note - स्वर ,Tempo - लय) for building familiriaty with music.
- Brief note about existence of 12 musical surs instead of only 7.

Mitigating Practical Challenges

Interaction during session

In Music LU, corresponding frequencies for all harmonium keys are to be noted. Practically, it is challenging due background noise and sensor senstivity. Instructor demonstrated these pratical issues in the session.

Discussion of using open-source smartphone application - *Arduino Science Journal* to record, store and utilize information about frequencies.

Enhancing the LU content

While taking observations, gauging the practical conditions (eg. backgroung noise etc.) is necessary. Some general guidelines to depict this challenge & suggestions to improve observation quality were added in teacher notes.

Step by step written guide for data collection and analysis was included in the LU.

Keeping in mind the present remote learning scenario, we have included some links to **virtual piano/harmonium** in the LU for open exploration. More tests to check its feasibility are under progress.

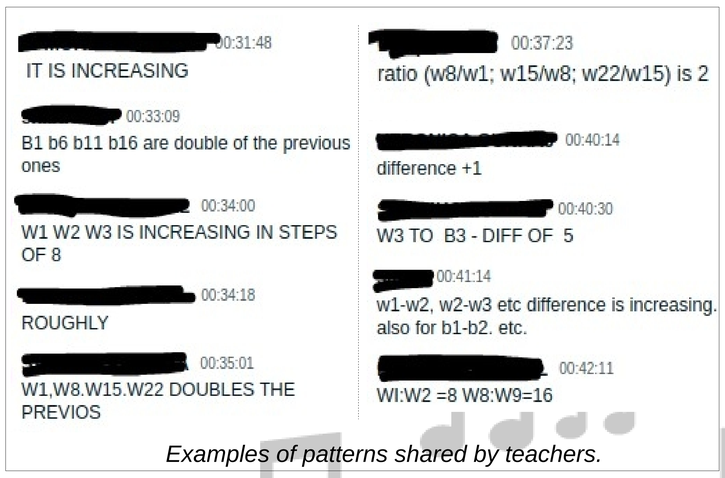
MUSIC AND MATHEMATICS

One is supposed to find patterns from frequency table. Teachers often find difficulties in beginning this task.

Keys	W1	B1	W2	B2	W3	W4	B3
Frequency (in Hz)	66	70	74	....			

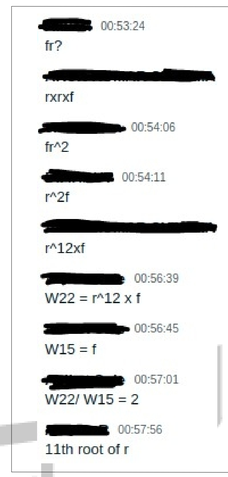
Some patterns are easily identified, while some, although important, may not occur immediately.

We included teacher notes stating some common patterns which are likely to be observed by students, as well as important patterns which should either emerge out with more attention, else teachers can nudge the discussion towards it.



Examples of patterns shared by teachers.

After identifying patterns, one must try to represent them mathematically. This is a new concept for higher secondary class students, and may require teacher's support.



Instructor: Can we mathematically predict the ratio based on the observed patterns?
Taking the first frequency as f, and the common ratio as r, what will be the 2nd frequency?
Teacher 1: fxr
Instructor: What about the third one?
Teacher 2: fr^2
Teacher 3: f.r.r

Instructor: If we take the frequency of W15 as f, what will be the frequency of W22 according to our previous discussion?
Teacher 3: f.r^12

Exerpts from the discussion session.

We incorporated detailed teacher notes to prompt discussions about the inter-connected-ness between Music & Mathemtics.

VIGYAN PRATIBHA
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'Music' : What it means? - Learning Unit
Arduino Science Journal application

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