

Patternmaking: Practice, Concepts, Culture

MathWeave Group

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Challenges

- We have so many needs in the classroom, that art education still finds itself forced to justify its place in the curriculum in a way not required by other “core” subjects.
- Art education does not seem to have made a strong enough case for “transference” of either skills or concepts despite obvious parallels.
- Art education has often been used to superficially “decorate” other subjects, with little discussion of overlapping concepts or cognitive benefits to learning, such as the social or mathematical underpinnings of patterns and making activities.
- Education in general has tended to segregate the learning and cognitive benefits that arise from active experiences, such as unconscious and tacit learning.
- Sooner or later, all art teachers confront this question: When will we ever use this?

MathWeave

- We are an eclectic research group interested in the inherent mathematical aspects of artistic creation, and in finding more effective ways of teaching and learning
- We find textile arts to be a particularly rich field for learning through making, pertaining not only to mathematics and art, but also to science, social studies, etc.
 - Textile arts offer many access points for learning to make, for appreciating design for use, and for developing useful concepts and experiences.
 - Patternmaking, geometry, and calculation are central to textile arts.
 - Textile arts have characterised most cultures worldwide and throughout time.
 - Textile making activities and values are as important as the objects produced.
 - Understanding a particular culture's textile making history is one key to understanding it.

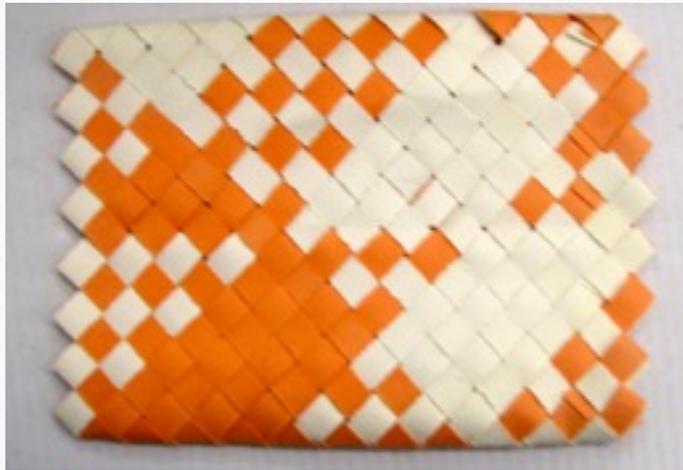
Why Weaving?

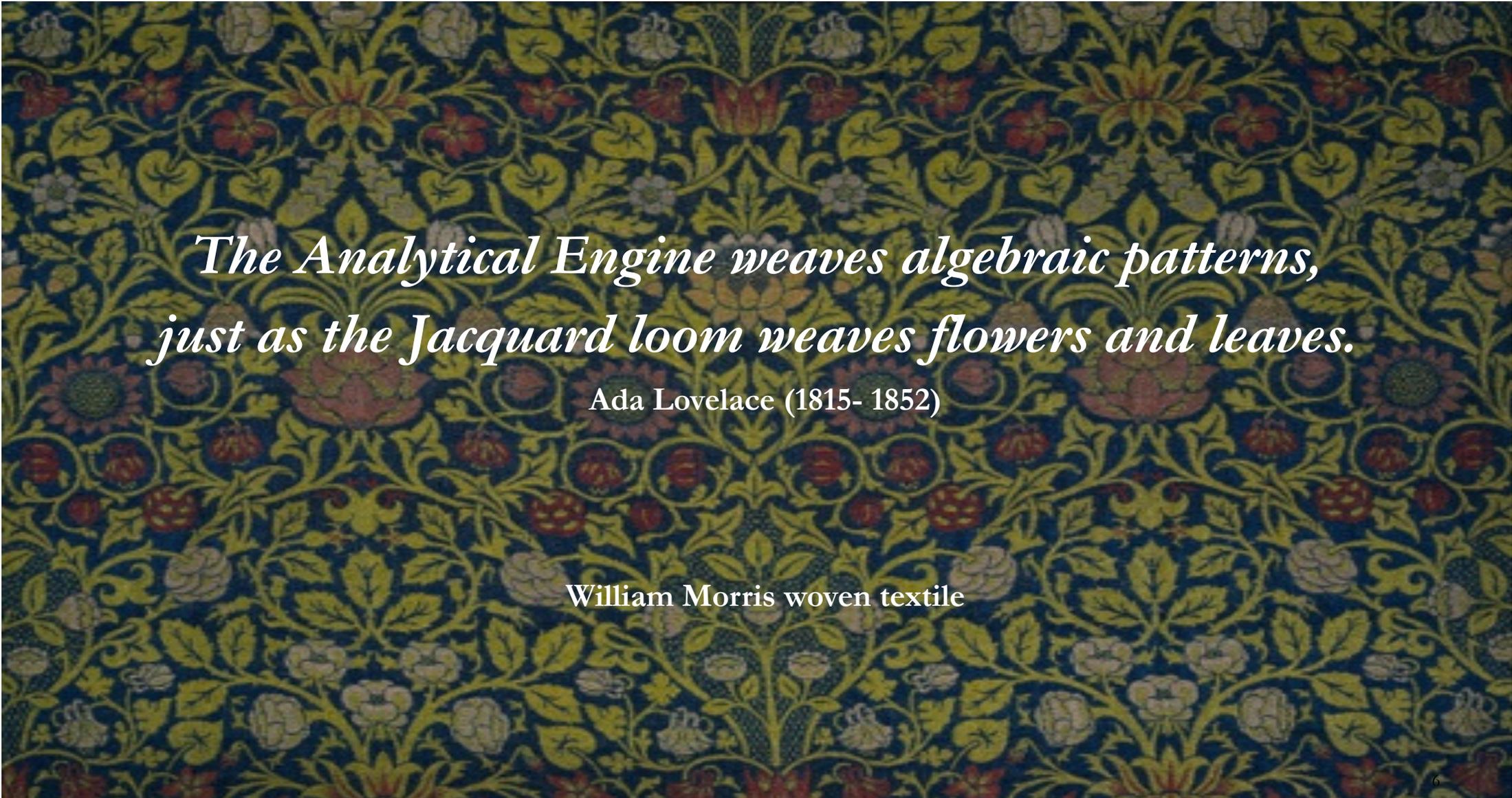
- Some weaving has interesting topological potential
- and mathematical characteristics.



Why Weaving?

- Weaving inevitably produces patterns.





*The Analytical Engine weaves algebraic patterns,
just as the Jacquard loom weaves flowers and leaves.*

Ada Lovelace (1815- 1852)

William Morris woven textile

Why Patternmaking is Essential

- Patterns are fundamental to cognition and conceptualisation.
- Patterns are so basic to the arts that they are often overlooked.
- Practice in making patterns helps students to understand important concepts of artistic practices, such as order, symmetries, balance, scale & proportion, etc.
- Culturally-specific patterns serve cultural identification.
- Making processes facilitate tacit and unconscious learning beyond what the final products project.
- Patternmaking exercises aesthetic judgment and sensitivities.
- Patterns express meaningfulness.
- Patternmaking invites experimentation.
- Patternmaking offers a window into cultural concerns and practices.

Why Making is Essential

- Making, tinkering, experimenting and posing interesting questions is the kind of activity that solves new problems, invents new applications, finds varieties of forms and, in some cases, produces new insights.
- Making includes more kids. Some students are more likely to do and to benefit from this kind of concrete investigation than from abstract applied analytics.
- Making is less intimidating and more fun than abstract subjects.
- Students value what their making produces, and how their skills grow.
- Weaving has many ways for students to approach it, and many ways for them to go deeply into it.
- All they have to do is to learn to change things, and observe what the changes do.

The Maker Movement

- The Maker Movement builds on the natural inclinations of children to learn and invent through curious play. Although it engages the availability of cool new technologies such as 3D printing, computer programming, e-textiles, etc., its growth suggests a revalidation of the power of learning through hands-on experience and motivated practice.
- <http://www.weareteachers.com/hot-topics/special-reports/how-the-maker-movement-is-transforming-education>
- Sylvia L. Martinez & Gary Stager (2013), *Invent to Learn. Making, Tinkering, and Engineering in the Classroom*. <http://www.inventtolearn.com/>

Variables and Change

- **Patternmaking is based on playing with variation – bend, twist, flatten, shrink, expand, copy, distort, flip, rotate, reflect, cut among many possibilities.**
- **The basic concept of ‘variable’ – the idea that there is something that can be changed and that change affects other things – is a key concept for arts, mathematics, science, and history.**
- **When you change something, and examine the change, you are on the verge of doing art; look closely and you start to develop sensitivities for art.**
- **Consider that if we value the idea of a ‘variable’ in all disciplines, we help children to develop cross-curricular connections and insights.**

Patterns Across the Curriculum

Patterns are found everywhere- art, mathematics, science, music, dance- every human endeavour.

- **We use math in patterns and every teacher has done activities that encourage pattern making and pattern seeking.**
- **Our goal is to show that you can take the pattern making and pattern seeking even further to illuminate many aspects of culture and many subjects. For example:**
 - **Analysis of the visual patterns and material culture that are iconic or specific to particular cultures or sub-cultures offers a way to understand something of that culture.**
 - **Attempting to reproduce such patterns, or to participate in them, offers more in-depth engagement and the potential for greater insight.**

Making with Rigor

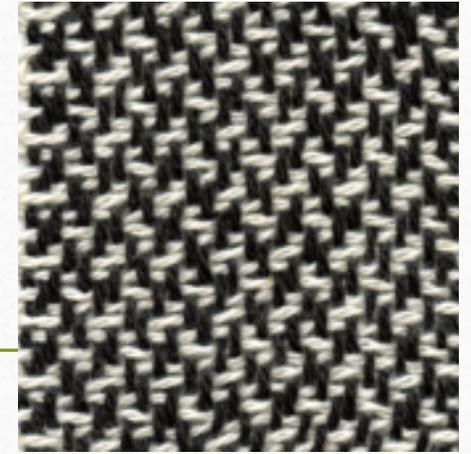
- It is not enough to make cool things. We have to make with rigor.
- Making with rigor requires students to account for what they make and how.
- Making with rigor will not likely be the same for all students.
- Multiple entry points and multiple ceilings.

Assessing Making with Rigor

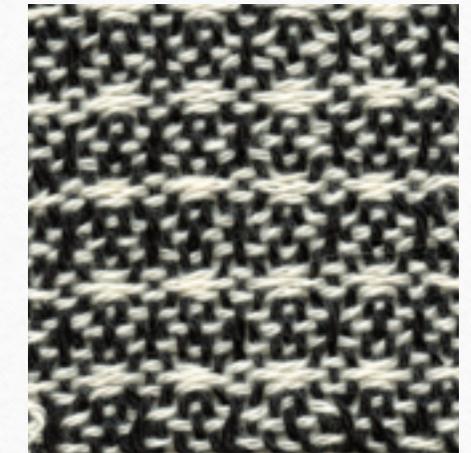
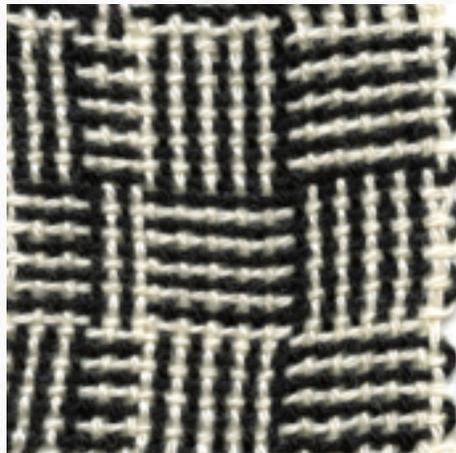
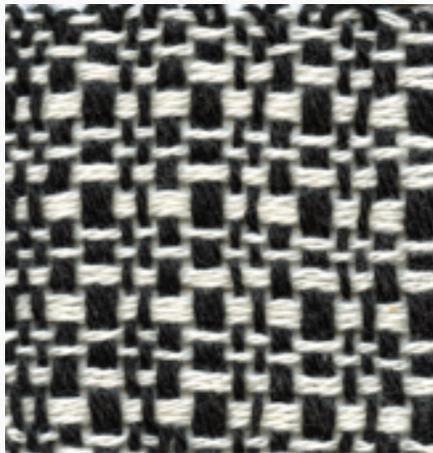
- Assess process as much as product.
- Student maintain portfolios documenting their making experiences.
- Younger students can do a version of show and tell about math objects they make. Older students can do group presentations about their objects or write in journals.

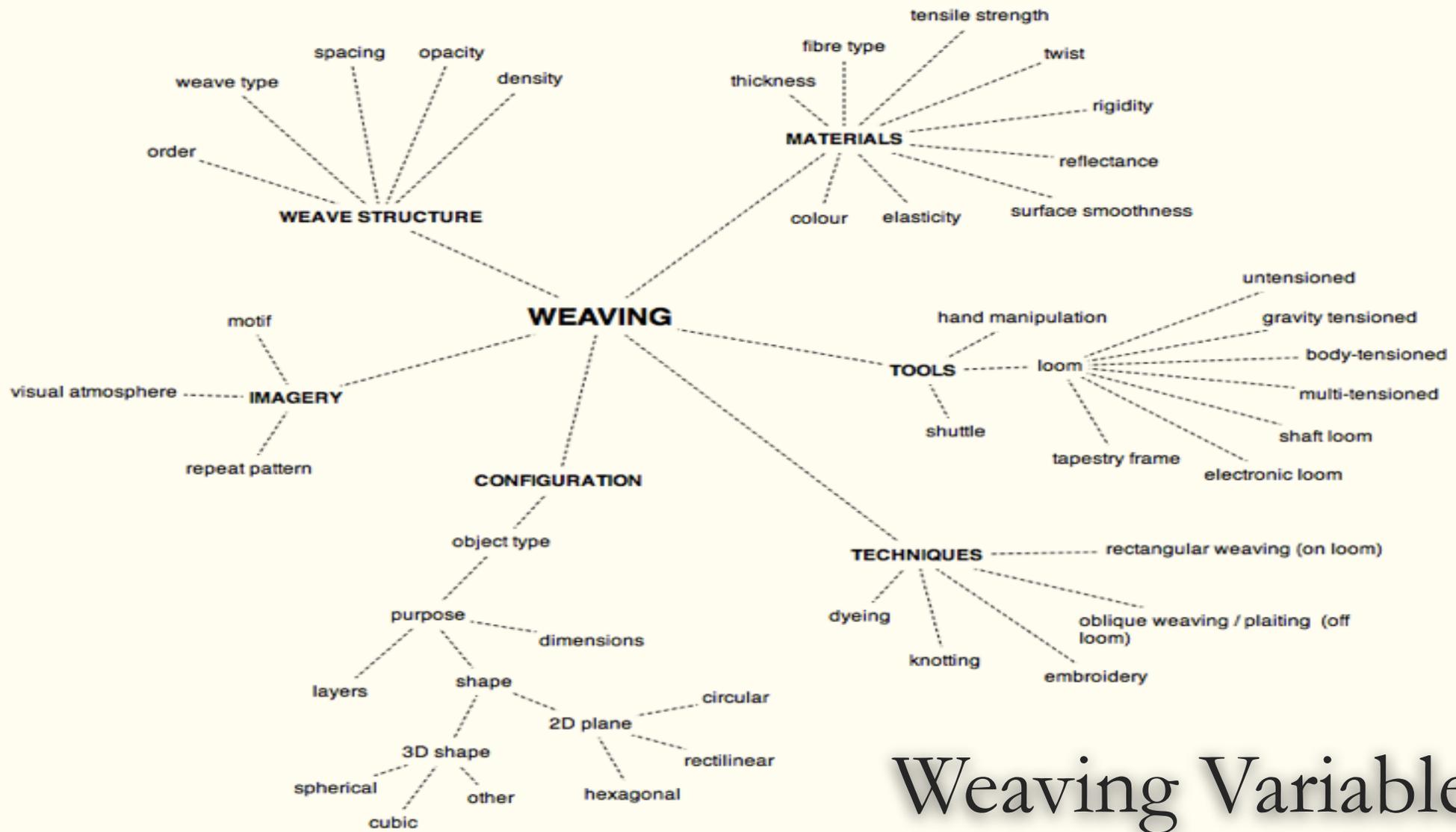
Making with Rigor

- Students can draw from weaving variables to help them to imagine, plan and create as well as to reflect, analyze and connect.
- Making with rigor incorporates talk, writing, diagrams, numbers, formulae, sketches, mindmaps, etc.



Weaving – A World of Pattern





Weaving Variables

Plaiting – Oblique Weaving



