Hawker Brownlow EDUCATION

13th Annual

Thinking & Learning Conferences

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Sunday 22 May

Why are these Students Behind in Mathematics?

Session 1

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Published in Australia by

Hawker Brownlow EDUCATION

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Printed in Australia

CODE: MELJK0301
0516

Why are these Students Behind in Mathematics?

Jane Kise, EdD

Your Ideal Professional Development Day

- Clear, practical goals
- Outline of key information
- Details for implementation
- Related to past learning
- Chances for reflection
- Independent study time
- In depth on insightful subjects
- Background materials
- Choices for further study
- Collaborative sharing end of day
- Tools I can use immediately
- Related to past learning
- Keep it practical, no theory
- Let me talk and try things
- Give immediate feedback
- Role in the planning
- Novel content and activities
- Brand new area of learning
- Group activities and discussion
- Forget the details, save for later

Studies Show Clear Jungian Patterns

- 47 students doing the same math tasks showed clear type-related, statistically significant differences in methods, feedback needs, use of manipulatives, and errors.
- 60 UCLA students -- all top academic performers, right-handed, 19-24, screened for type and for "lab readiness" -- showed type patterns in brain lab activities.

Of Course Type Doesn't Explain Everything!

- Randomly selected people share 33% of neocortex activity. Statistically significant.
- People of same type share more activity
  - Half share 70-90% of the same brain activity
  - The rest share 50-70% of the same brain activity
  - 20% of activity is different from others of same type due to context, gender, physiology, training, upbringing, etc.

Big Type/Brain Ideas

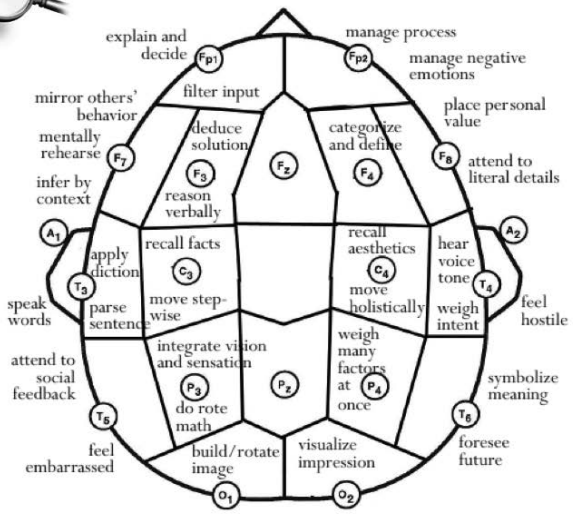
Various regions do similar tasks for all of us.

BUT… People vary greatly in how much stimulus is needed to activate a region.

Type strongly relates to brain activity.

There are unique global patterns that correlate to the 8 Jungian functions.

Bird's Eye View Brain Map



Learning styles are not about constantly matching instruction to each student's style

Instead, teachers and students need to understand when each style is needed and how to adapt when instruction is out of their style

A central tenant of type theory:

...that all types have the potential for competence but that their preferred processes may put them at a temporary disadvantage until they can find a means (or a mentor) to assist them in the transition to the unfamiliar territory of new learning.

Myers, McCaulley, Quenk & Hammer

Differentiation Implications

1. Allow students to control when they receive feedback
   - Red card/green card
   - Answer sheets
   - Questions

Differentiation Implications

2. "Norm" the use of manipulatives and representations
   - Class sets readily available
   - "Show" your solution
   - Manipulatives large enough for groups to use
   - Emphasis on explanations that all students understand

Differentiation Implications

3. Develop "families" of tasks instead of repetitive tasks
   - Increase difficulty OR
   - Concrete-pictorial-abstract OR
   - Adding creativity, writing word problems, ways to illustrate concepts, methods for teaching others, etc.

Differentiation Implications

4. Question to probe mathematical understanding, whether answers are right or wrong
   - Avoid "right answer thinking"
   - Ready questions in advance
   - "Explain it as if I were your little brother/ sister"

Handout 1

Below are brief descriptions of four of the eight personality preferences that combine to describe 16 personality types. Which best describes your *natural* style? Remember, your preferences are like handedness; with practice, you can learn to use the opposite preference but one remains easier and more natural.

Extraversion (E) or Introversion (I)
Key: How are you *Energized?*

Which best describes your natural style?

Extraverts *prefer*:	**Introverts *prefer*:**
• Talking things out	• Thinking things through
• Variety and action	• Concentration and reflection
• Forming thoughts through discussion	• Waiting to share until thoughts are formed
• Focusing on the outer world	• Focusing on the inner world
• Activity before reflection	• Reflection before activity

To consider your own style, think of times that you needed help with a problem, or hoped to try something new in your classroom. Do you like to first talk it through with a trusted colleague or first think about your own solutions and ideas?

Sensing (S) or Intuition (N, the I was used for Introversion)
Key: What *Information* grabs your attention?

Which best describes your natural style?

Sensing types *prefer:*	Intuitive types *prefer:*
• Accuracy	• Insights
• Using experience as a guide	• Using imagination as a guide
• Following the steps (orderly directions and information)	• Plunging in (using hunches to fill in missing steps or information)
• Paying attention to reality	• Paying attention to possibilities
• Working with proven methods and curriculum	• Working with innovative methods and ideas

Teachers sometimes discover their own style by thinking about curriculum. Sensing teachers, especially in their first few years in the classroom, often view curriculum as their lesson plans. They may work straight from it, perhaps not feeling comfortable skipping over sections for fear of leaving out an important concept. In contrast, Intuitive teachers often view curriculum as a platform for brainstorming. Their actual lesson may or may not bear much resemblance to the original materials.

Handout 2

Learning Styles

While all eight psychological preferences are important for teaching and learning, concentrating on Extraversion, Introversion, Sensing and Intuition ensures that students have the **energy** and the **information** they need to learn.

If teachers begin by planning in their normal style, or with the curriculum, and then adjust for the quadrant whose needs are least met, they will in fact meet the needs of all four quadrants. This creates a manageable process for differentiation. As teacher type knowledge increases, they can make further adjustments.

IS: Let me know what to do	**IN: Let me follow my own lead**
• Set clear expectations and goals • Show me examples • Provide the steps in the process • Answer my questions as I have them • Give me time to think • Let me work with and memorize facts • Avoid too many surprises • Build on what I know • Let me know along the way if I'm doing things right • Connect content with past efforts and experiences	• Let me delve deep into things that interest me • Avoid repetition and routine • Let me figure out for myself how to do things • Give me choices • Listen to my ideas • Let me learn independently • Let me start with my imagination • Help me bring what I envision into reality • Give free rein to my creativity and curiosity • Provide references for me to build my own knowledge base
ES: Let me do something	**EN: Let me lead as I learn**
• Start with hands-on activities • Give me steps I can follow • Let me think out loud and work with others • Tell me why I'm learning something • Give me chances to talk and move • Set a realistic deadline • Give me examples • Provide clear expectations • Go light on theory • Let me use my experience and skills	• Start with the big picture, not the details • Let me dream big without penalties • Let me find a new way to do it • Let me interact with others • Give me choices • Keep changing what we do • Let me teach or tell someone what I've learned • Le me be in charge of something • Let me talk or work in groups • Let me come up with my own ideas

Handout 3

Learning Style Characteristics Seen In Math Task Films

For this project, 100 6th grade students were filmed while completing fractions tasks. All had access to markers, plain paper, 1" square paper, isometric graph paper, and color tiles. The following information summarizes the differences in ways students with different learning styles approached the same tasks.

Introversion and Sensing (IS)

At their best:

- Asked questions to clarify understanding
- Checked work before explaining answer
- Applied a literal interpretation of some of the problems, leading to quick solutions

Struggles

- Were unwilling to experiment if they were uncertain
- Were easily confused by examples if they were not chosen carefully
- Hesitated before asking questions

Task behaviors

- Used squares paper and markers; none used tiles unless the facilitator suggested it
- Only one used numbers to find common denominators

Introversion and Intuition (IN)

At their best:

- Showed perseverance when exploring their thinking
- Looked for innovative ways to solve a problem
- Applied learning from one problem to next

Struggles

- Made careless mistakes that interfered with their thinking
- Trusted own hunches, seldom sought clarification or new information

Task behaviors

- Often drew shapes other than rectangles or used isometric graph paper
- One student built shapes with markers rather than the tiles
- Worked quietly for up to nine minutes on a task
- Many used numbers to find common denominators or equivalent fractions

Extraversion and Sensing (ES)

At their best:

- Experimented with tiles and drawings to find solutions
- Quickly asked for clarifications
- Clearly articulated ideas and questions

Struggles:

- Asked for feedback continually
- Inaccuracies in drawings affected their thinking
- Struggled to transfer concepts to new problems. For example, if they understood how to make a bigger shape including fourths, that knowledge did not transfer to the problem concerning sixths

Task behaviors:

- Altered the materials to make sense of problems (only ones who shaded tiles, divided graph squares in half, etc., to fit in thirds and sixths)
- Used trial and error without asking for help in between experiments
- None used numbers to find common denominators

Extraversion and Intuition (EN)

At their best:

- Applied learning from one problem to the next
- Confidently proceeded on their own understandings

Struggles

- Accuracy in counting and in explanations
- Struggled to unlearn something they inferred or a conclusion they drew
- Communicated in general terms that increase difficulty of clarifying their misunderstandings

Task behaviors

- Careless mistakes; used colors that did not match problem or counted tiles and squares incorrectly
- Unaware of the denominator they were illustrating, i.e., talking about 12ths while illustrating 10ths.
- So confident in their answer that they didn't see mistakes even while explaining their solution
- Long verbal explanations

Handout 4

Influence of Type Preferences on Students During Instructional Intervention

The following chart illustrates the different ways students with different type preferences engaged in the same activities during intervention sessions.

Activity 1: Goal: Understanding the meaning of the numerator and denominator. Students built shapes with specific fractional parts, using color tiles.

Activity 2: Goal: Finding equivalent fractions and adding fractions. Students, working in pairs, rolled fractions dice, recorded the fractions on individual whiteboards, modeled the equation with fraction strips, and then added the fractions.

Introversion and Sensing • Activity 1: These students often asked for extra practice. For example, after they built a 3-tile shape that was 1/3 blue, then a 4-tile shape that was 1/4 blue, many asked for additional simple tasks (1/5 blue and so on) before moving on to more complex tasks. • Activity 2: Although they were only asked to complete and record at least 5 different dice rolls, many of these students completed 10 or more. They also kept using the fractions strips until the instructor asked them whether they could do the problems without them.	**Introversion and Intuition** • Activity 1: These students quickly mastered the concept of building shapes with different fractions. Several asked to draw rather than build shapes, and also quickly moved to working independently on tasks that involved fractions with different denominators. • Activity 2: Several students rushed through the task, getting most of the 5 required problems wrong. We then required 5 *correct* equations before they could move on. This seemed to motivate them to be more careful.
Extraversion and Sensing • Activity 1: These students frequently said how much they liked working with the tiles, saying, "I can *see* the fractions." • Activity 2: These students loved the chance to sit on the floor to roll the dice, coming up with their own rules for the toss. They also enjoyed working together with the large magnetized strips on the classroom whiteboards rather than individual desk-sized sets.	**Extraversion and Intuition** • Activity 1: These students quickly mastered the concept of building shapes with different fractions and enjoyed working together to solve problems that involved fractions with different denominators. They frequently miscounted their tiles or used the wrong colors. • Activity 2: These students enjoyed rolling the dice, but made frequent mistakes until required to solve a few problems with the fractions strips.

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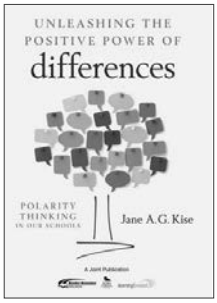

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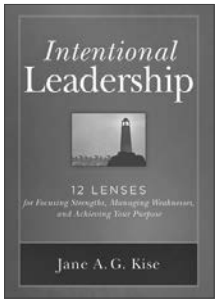

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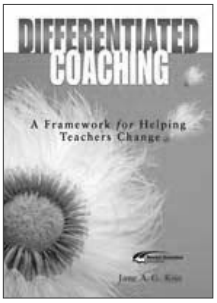

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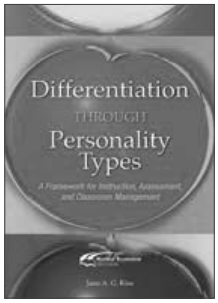

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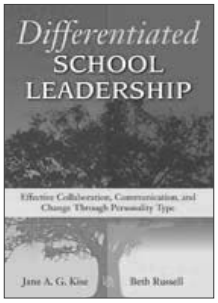

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