Lost in the flow rate: Deciphering medication questions by extracting and unpacking the physical concepts.

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• My background
  – Plus RMIT nursing
  – Med calculations requirements

• Similarities between pedagogy of writing and med calculations

• What thing is getting “lost in the flow”?  
  – The *Semantic Wave* and unpacking the basics

• The new RMIT Nursing Resource
  – How does it address these issues?
MY BACKGROUND
KEEP CALM AND WRITE YOUR ESSAY
THE TEACHING NEXUS BETWEEN WRITING & NURSING CALCULATIONS
PARALLELS TO TEACHING WRITING

Question Analysis
Identify the task....

- Half a litre of normal saline with 2g potassium chloride is to be given to a patient IV. How long will this take if the infusion pump is set at 75ml/hr?
- Half a litre of normal saline with 2g potassium chloride is to be given to a patient IV. **How long will this take** if the infusion pump is set at 75ml/hr?
PARALLELS TO TEACHING WRITING

Extracting key information
• Half a litre of normal saline with 2g potassium chloride is to be given to a patient IV. How long will this take if the infusion pump is set at 75ml/hr?

• **Half a litre** of normal saline with 2g potassium chloride is to be given to a patient IV. **How long** will this take if the infusion pump is set at **75ml/hr**?

• Volume = 0.5 L

• Flow rate = 75mL/hr

• Time = ?
PARALLELS TO TEACHING WRITING

Defining key terms and concepts
Half a litre of normal saline with 2g potassium chloride is to be given to a patient IV. How long will this take if the infusion pump is set at 75 ml/hr?

ml / hr ?
That’s a flow rate...

How many millilitres flow during a minute?

How many millilitres flow during an hour?

How long does it take to receive 75ml?
PARALLELS TO TEACHING WRITING
Provide transferable frameworks
Formulae used in this Book

\[
\text{Volume required (VR)} = \left(\frac{\text{Strength required (SR)}}{\text{Stock strength (SS)}}\right) \times \left(\frac{\text{Volume of stock solution (VS)}}{\text{Volume (mL)}}\right)
\]

\[
\text{Volume (mL)} = \text{Rate (mL/hr)} \times \text{Time (hr)}
\]

\[
\text{Time (hr)} = \frac{\text{Volume (mL)}}{\text{Rate (mL/hr)}}
\]

\[
\text{Rate (mL/hr)} = \frac{\text{Volume (mL)}}{\text{Time (hr)}}
\]

\[
\text{Rate (mL/hr)} = \frac{\text{Volume (mL)} \times 60}{\text{Time (min)}}
\]

\[
\text{Rate (drops/min)} = \frac{\text{Volume (mL)} \times \text{Drop factor (drops/mL)}}{\text{Time (minutes)}}
\]

\[
\text{Rate (drops/min)} = \frac{\text{Volume (mL)} \times \text{Drop factor (drops/mL)}}{\text{Time (hours)} \times 60}
\]

\[
\text{Running time (hours)} = \frac{\text{Volume (mL)}}{\text{Rate (mL/hr)}}
\]

\[
\text{Concentration of stock (mg/mL)} = \frac{\text{Stock strength (mg)}}{\text{Volume of stock solution (mL)}}
\]

\[
\text{Dosage (mg)} = \text{Volume (mL)} \times \text{Concentration of stock (mg/mL)}
\]

\[
\text{Hourly dosage (mg/hr)} = \text{Rate (mL/hr)} \times \text{Concentration of stock (mg/mL)}
\]

\[
\text{Rate (mL/hr)} = \frac{\text{Hourly dosage (mg/hr)}}{\text{Concentration of stock (mg/mL)}}
\]

\[
\text{Weight of dextrose (g)} = \text{Volume of infusion (mL)} \times \text{strength of solution (g/100mL)}
\]

\[
\text{Dose required (mg)} = \text{Body surface area (m²)} \times \text{Recommended dosage (mg/m²)}
\]
FlowRate = Volume / Time

Dosage Rate = Flow Rate x Concentration

\[ Vol_{Req} = \frac{SR}{SS} \times \frac{SV}{1} \]
PARALLELS TO TEACHING WRITING

Modularise tasks
Calculate the required drip rate in drops per minute for an adult male who is to be given half a litre of normal saline over 5 hours using an IV set which gives 20 drops per millilitre.
Calculate the **required drip rate in drops per minute** for an adult male who is to be given **half a litre** of normal saline over **5 hours** using an IV set which gives **20 drops per millilitre**.
\[
\text{Rate (drops/ min)} = \frac{\text{Volume (ml)} \times \text{Drop Factor (drops/ml)}}{\text{Time (hrs)} \times 60}
\]

\[
\text{Rate} = \frac{0.5 \text{L} \times 20 \text{ drops/ml}}{5 \text{ hrs} \times 60}
\]

\[
\text{Rate} = \frac{500 \text{ ml} \times 20 \text{ drops/ml}}{300 \text{ min}}
\]

\[
\text{Rate} = \frac{10000 \text{ drops}}{300 \text{ min}}
\]

\[
\text{Rate} = \frac{100 \text{ drops}}{3 \text{ min}}
\]

\[
\text{Rate} = 33.3 \text{ drops/min}
\]
• Calculate the required drip rate in drops per minute for an adult male who is to be given half a litre of normal saline over 5 hours using an IV set which gives 20 drops per millilitre.

Flow rate = Volume / Time

Flow rate = 10000 drops / 300 mins
= 100 drops / 3 min
= 33.3 drops per min

5 hours = 300 minutes

0.5 L = ? drops
= 500 ml
= (500 x 20) drops
= 10000 drops
PARALLELS TO TEACHING WRITING

Address EAL or numeracy issues early
PARALLELS TO TEACHING WRITING: SUMMARY
We need to EXPLICITLY teach HOW TO

**in Academic writing**
- determine writing task
- content, directive and limiting words
- key words, concepts and terminology
- textual and paragraph structure
- research and writing processes

**in Nursing calculations**
- read the question
- identify necessary information
- define and understand terminology
- use transferable frameworks
- use non-linear and modular processes
- maintain overview

- determine sought value
- values required for calculation
- quantities and units
- formulae structure & transposing
- solution processes
Pitfalls and consequences

In Academic writing

• Misinterpreted task requirements
• Convoluted, meandering or disjointed text
• Weak arguments or unclear discourse
• Text drafts unamenable to restructure
• Failure to answer the question

In Medication calculations

• Directionless “solving”
• Wrong or misapplied formula
• Question details overwhelm
• ‘Random’ and ‘decorative’ use of units
• Inflexible rote learning of processes
• Overly long complex calculations
• Difficulty isolating errors
**Semantic Density**: condensed symbolic language, discipline specific, highly contextual, requires insider knowledge to understand

**Semantic Gravity**: specific, concrete, terminology rich

**Semantic Density**: not condensed, discursive, everyday language:

**Semantic Gravity**: accessible to all, wording not rigidly defined by discipline.

Presenting a written problem

Unpacking problem text, formulae and units.

Integrating into a solution

Contextualised to nursing practice

Solutions demonstrated

BUT

Unpacking text and concepts left to students!!
Existing Resources

- Repetitive drill
- Substitution
- Input – output
- Limited problem solving
- Static page pdf

RMIT Learning Lab Nursing Resource

- Unpacks concepts, formulae and units
- Text manipulated on screen
- Voiced explanations
- New interactivity
• https://www.dlsweb.rmit.edu.au/lsu/testing/nursing/index.html#/home/nursingcalculations