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?

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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?

- How many millilitres flow during a minute?
- That’s a flow rate...
- 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

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

Volume (mL) = Rate (mL/hr) \times Time (hr)

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

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

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

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

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

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

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

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

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

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

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

Dose required (mg) = \( \text{Body surface area (m}^2\) \times \text{Recommended dosage (mg/m}^2\)
FlowRate = Volume/Time

Dosage Rate = Flow Rate × Concentration

\[ \text{Vol Req} = \frac{SR}{SS} \times \frac{SV}{1} \]
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**.
\[
\text{Rate (drops/min)} = \frac{\text{Volume (ml)} \times \text{Drop Factor (drops/ml)}}{\text{Time (hrs) \times 60}}
\]

Rate = \frac{0.5 \times 20 \text{ drops/ml}}{5 \times 60}

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

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

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

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.

\[
\text{Flow rate} = \frac{\text{Volume}}{\text{Time}}
\]

\[
\begin{align*}
\text{Flow rate} &= \frac{0.5 \text{ L}}{300 \text{ mins}} \\
&= \frac{500 \text{ ml}}{300 \text{ mins}} \\
&= \frac{(500 \times 20) \text{ drops}}{300 \text{ mins}} \\
&= 10000 \text{ drops / 300 mins} \\
&= 100 \text{ drops / 3 min} \\
&= 33.3 \text{ drops per min}
\end{align*}
\]
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**
- determine sought value
- values required for calculation
- quantities and units
- formulae structure & transposing
- solution processes

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

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

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

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Presenting a written problem

Unpacking problem text, formulae and units.

Contextualised to nursing practice

Solutions demonstrated

Integrating into a solution

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
THE RESOURCE
• https://www.dlsweb.rmit.edu.au/lsu/testing/nursing/index.html#/home/nursingcalculations