Development of an innovative teaching toolbox for pharmacokinetics

SJ Tucker and HM Wallace



School of Medicine, Medical Sciences & Nutrition

University of Aberdeen

Pharmacokinetics

- In pharmacology (clinical and basic), pharmacokinetics (PKs) is a key aspect of the curriculum in terms of drug development, design and administration.
- Forges links between raw data and actual clinical/pharmacological meaning in a stepby step manner:

prrect answer - D: 1.8 hours

To determine the rate of absorption you need to calculate residual points from the area of the plot were elimination and absorption are occurring at similar rate – this is the area along the peak of the curve.

Project elimination back to cross the y-axis and subtract actual points on the curve (C1 and C2) from projected points (A1 and A2). This will give you



 Questionmark

 Reading the 100 µg/ml sample produces the following absorbance value:

 1.223

 J.223

 Interactivity with equipment to generate data

BRITISH

SOCIETY

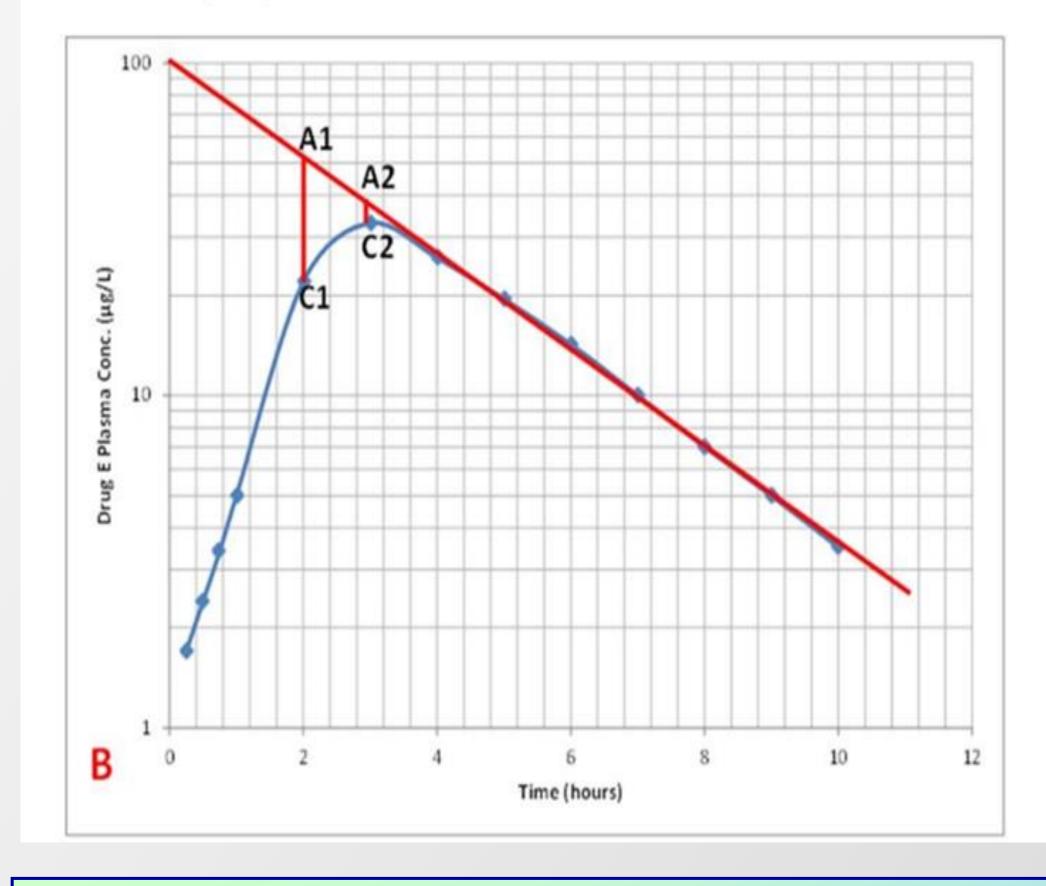
PHARMACOLOGICAL

- The traditional didactic approach is dull making it challenging for both learners and educators.
- UG/PGT feedback shows new approaches are required to develop and enhance student engagement with this *threshold concept*.

Aim

• Creation of interactive and innovative approaches to invigorate the way pharmacokinetics are taught.

• A "students as partners" approach ensured applicability and relevance to the student experience/perception of the subject area. a new data series which you then plot.



Project 3: A PK practical suite

 A series of practical exercises were designed and implemented utilising a

Questionmark Using the elimination rate constant (k _{el}), calculate the half life (t _{1/2}) in min. Again enter this as a number without units to 2 decimal places.	<section-header><section-header><section-header><text><text><text><text></text></text></text></text></section-header></section-header></section-header>
Instructive feedback to build experience and understanding Evaluation	
→ 700 hits by UG cohort	(50 students)
\rightarrow 400 <i>hits</i> by PGT coho	rt (30 students)
Feedback on project 3:	

"Really useful for understanding concepts"

"clear and useful"

"I better understood the concepts when I was doing the lab work and writing up the report"

• 4 projects undertaken funded by <u>2 BPS</u> <u>teaching grants</u> and Institutional Learning and Teaching Enhancement Project money.

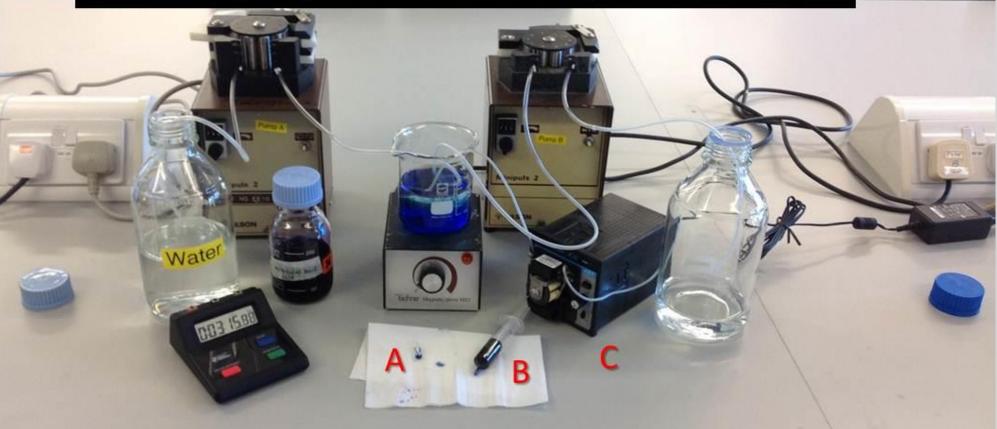
Project 1: Online learning hub

- Simple design involving a hierarchy of interlinking spreadsheets available through the virtual learning platform (Blackboard).
- Created a flexible and adaptable resource written <u>for students, by students.</u>
- By interlinking a variety of spreadsheet types an innovative and effective learning package was delivered:



designed and implemented utilising a simple experimental model system:

central beaker contains volume of distribution, pumps mimic clearance process



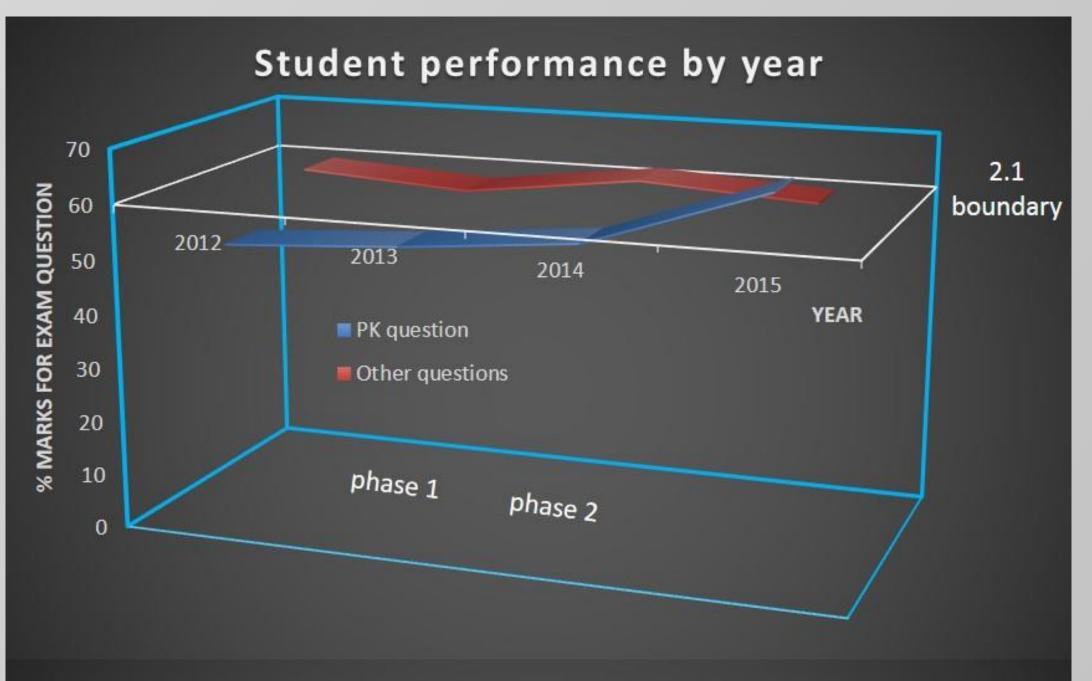
3 methods of administering methylene blue: A) Capsule (mimics oral) B) Syringe (mimics IV bolus) C) Infusion pump

The apparatus used to model pharmacokinetic processes in class practicals. This has created a novel, interactive and innovative way of teaching the subject and allowing students to bring the numbers to life.

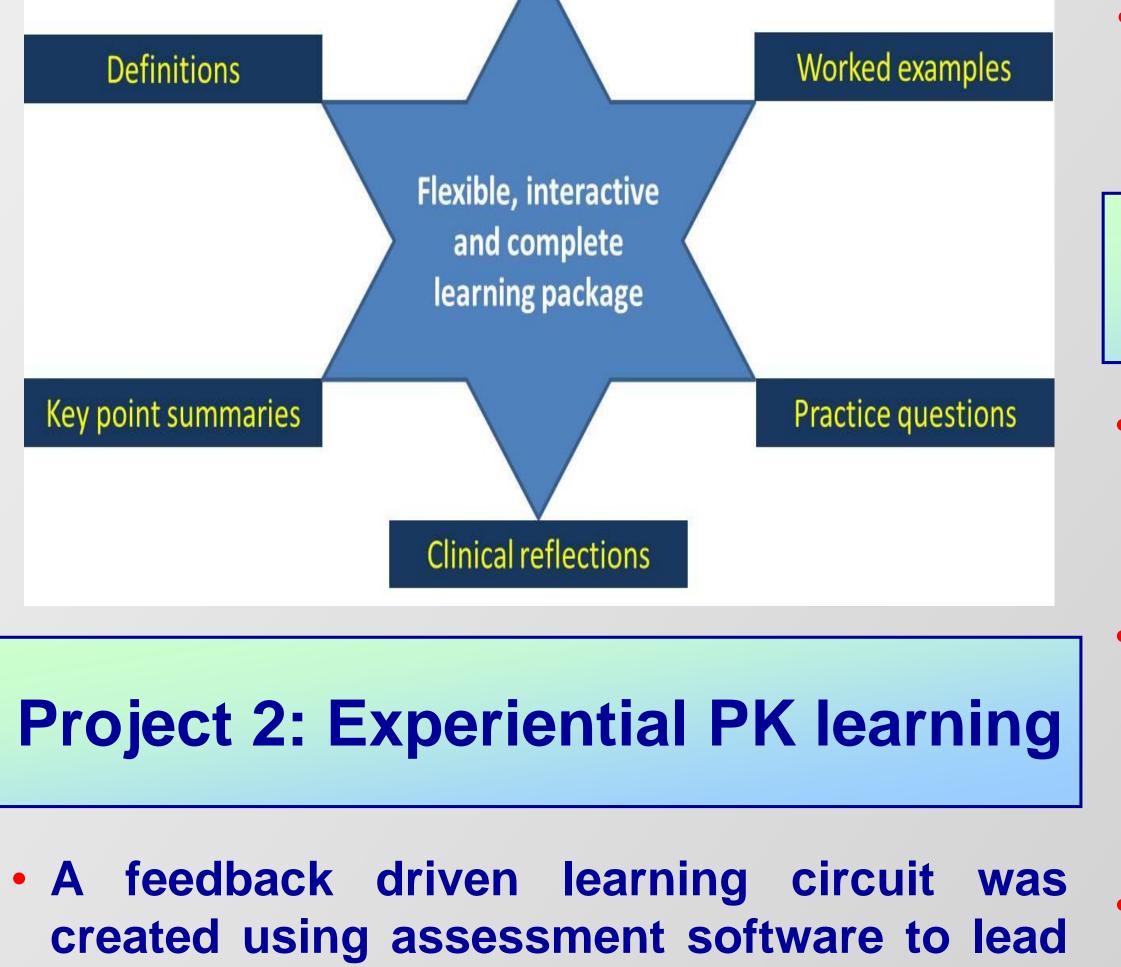
- By modelling the elimination of a drug (methylene blue) from the system, students can visualise PK processes.
- The system can generate data pertaining to single and multiple IV, oral and infusion based administration.

"they helped in understanding the theoretical part of the course"

 Impact on grades in level 3 UG PK assessments after 2 phase introduction (practicals 2012/online resources 2014):



PK performance relative to all other question areas by year



students through the process of handling

PK data.

Project 4: Online PK simulations

 Adaptation of practical exercises outlined in project 3 to online feedback driven exercises.

 Utilises feedback loops to guide users through the set-up and operation of the model system, with subsequent data production and analysis.

 Provides added flexibility and accessibility for this unique practical PK teaching approach.



Conclusion

- This holistic approach has invigorated a traditionally difficult curricular area and enhanced student experience/performance.
- Designs applicable across disciplines.
- We would like to acknowledge our student partners: Shelby Barnett (project 1) and Alex Currie (project 2).