Research Study: Adaptive Learning Domain Model for Post-Primary Mathematics

You are invited to participate in this research study. Your participation is voluntary. Agreement to participate is signified by clicking on the 'NEXT' button immediately below. You will then reach the first page of the electronic survey. The last page of this electronic survey contains a 'SUBMIT' button. When you click on the 'SUBMIT' button, your completed survey will be electronically submitted to the principal investigator, Gerard Kilkenny. If at any stage during the survey you decide you do not wish to complete and submit it, simply close your browser page/tab or exit your browser.

*Required

Teaching Experience

The design, development and evaluation of an adaptive learning domain model for post-primary mathematics.

1. **For how many (whole) years have you taught Mathematics?** *
   Mark only one oval.
   - ◯ 1 to 5
   - ◯ 6 to 10
   - ◯ 11 to 15
   - ◯ 16 to 20
   - ◯ More than 20

2. **What percentage of your current timetable is Mathematics?** *
   Mark only one oval.
   - ◯ 0% to 25%
   - ◯ 26% to 50%
   - ◯ 51% to 75%
   - ◯ 76% to 100%

3. **Is Mathematics one of your final year degree subjects?** *
   Mark only one oval.
   - ◯ Yes
   - ◯ No

4. **Have you the Professional Diploma in Mathematics for Teaching (Level 8)?** *
   Mark only one oval.
   - ◯ Yes
   - ◯ No

Adaptive Learning (Concept)

The design, development and evaluation of an adaptive learning domain model for post-primary mathematics.

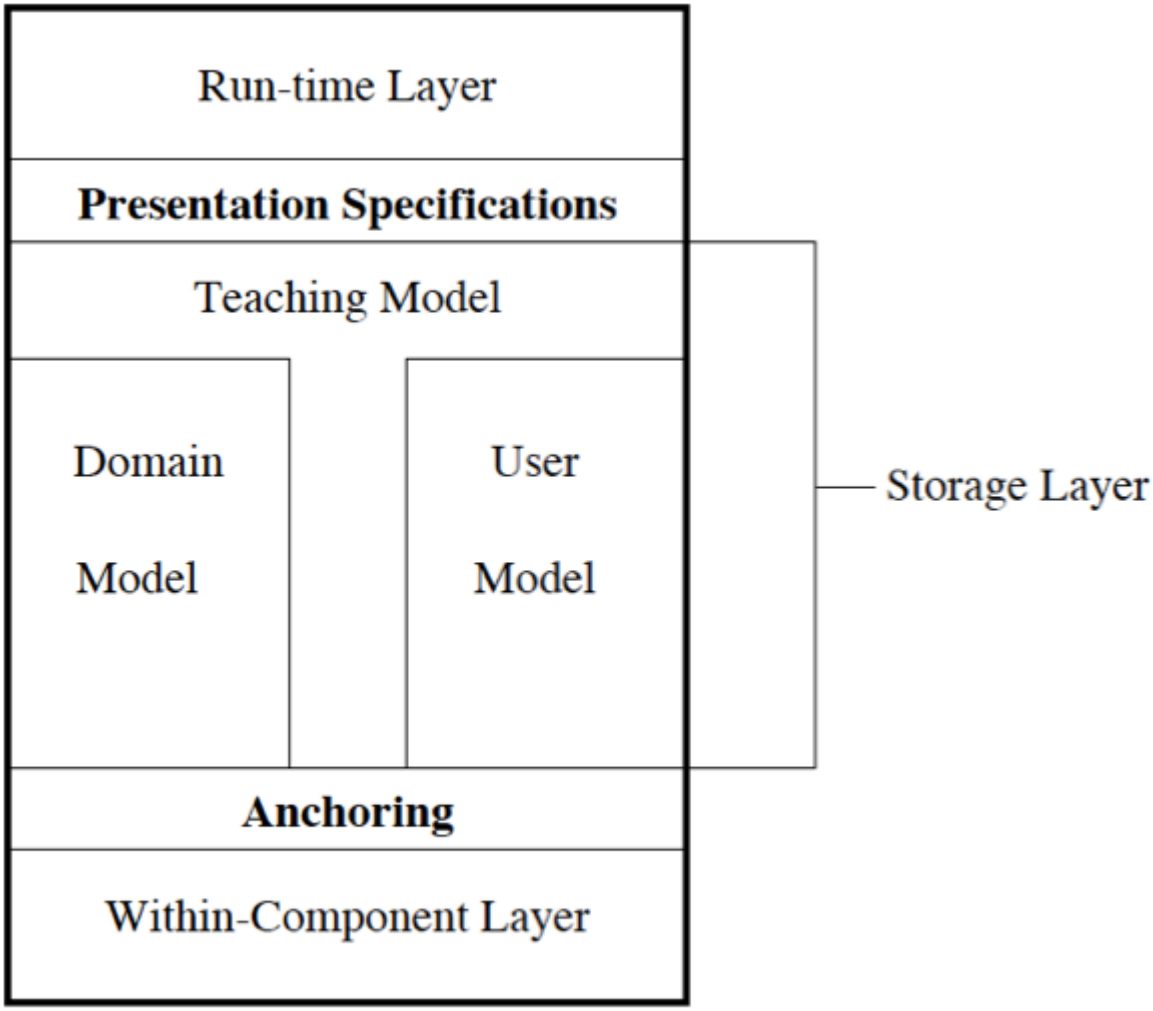


Figure 1: The AHAM model

5. **I was aware of the concept of Adaptive Learning prior to this Research Study** *
Mark only one oval.

- ◯ Yes
- ◯ No

6. **I understood the concept of Adaptive Learning prior to this Research Study** *
Mark only one oval.

- ◯ Agree
- ◯ Neutral
- ◯ Disagree

7. **I understand the concept of Adaptive Learning having watched Screencast (Part 1 of 3)** *
Mark only one oval.

- ◯ Agree
- ◯ Neutral
- ◯ Disagree

Domain Model (in Adaptive Learning)

The design, development and evaluation of an adaptive learning domain model for post-primary mathematics.

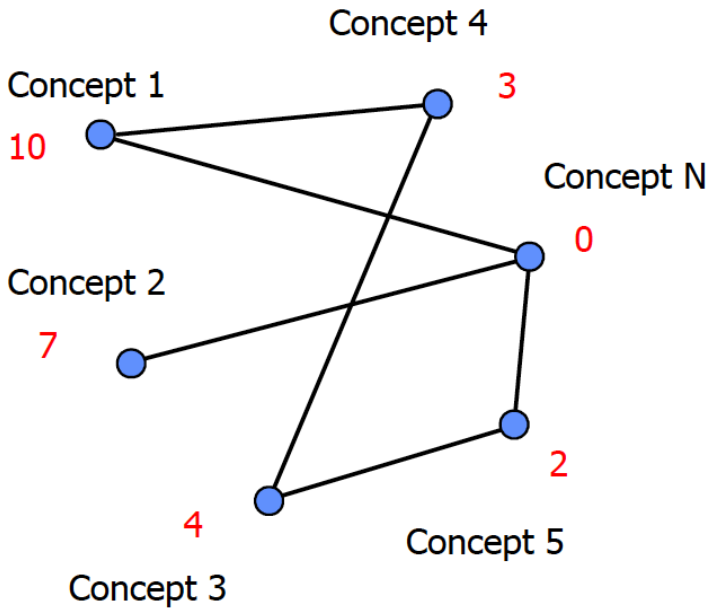


Fig. 1.3. A network domain model with a simple numeric overlay user model

8. **I was aware of the idea of a Domain Model prior to this Research Study.** *
Mark only one oval.

- Yes
- No

9. **I understood the idea of a Domain Model prior to this Research Study.** *
Mark only one oval.

- Agree
- Neutral
- Disagree

10. **I understand the idea of a Domain Model having watched Screencast (Part 1 of 3).** *
Mark only one oval.

- Agree
- Neutral
- Disagree

Domain Model for Mathematics (Unpacking Learning Outcomes)

The design, development and evaluation of an adaptive learning domain model for post-primary mathematics.

Excel Spreadsheet of 45 Unpacked Learning Outcomes

	A	B	C	D
1	Strand	Outcome	Unpacked Learning Outcomes	Level
2				
3	GT	5a-1	find distance (slant), using Pythagoras theorem	O
4	GT	5a-2	find distance (slant), using formula	O
5	GT	5a-3	find and interpret slope, using rise and run	O
6	GT	5a-4	find slope, using formula	O
7	GT	5b-1	draw graphs of line segments	O
8	GT	5b-2	extend line to find y intercept graphically	O
9	GT	5b-3	interpret linear functions/line segments in context, including discussing rate of change (slope) and y intercept	O
10	GT	5c-1	find the equation of a line in the form y = mx + c	O
11	GT	5c-2	interpret the equation of a line in the form y = mx + c, including finding the slope	O
12	GT	5c-3	interpret the equation of a line in the form y = mx + c, including finding the y intercept	O
13	GT	5c-4	interpret the equation of a line in the form y = mx + c, including finding more points	O
14	AF	1a-1	represent linear patterns and relationship in tables	O
15	AF	1a-2	represent linear patterns and relationships in graphs	O
16	AF	1a-3	represent quadratic patterns and relationships in tables	O
17	AF	1a-4	represent quadratic patterns and relationships in graphs	O
18	AF	1a-5	represent exponential patterns and relationships in tables	O
19	AF	1a-6	represent exponential patterns and relationships in graphs	O
20	AF	1b-1	write a generalised expression for linear patterns in words	O
21	AF	1b-2	write a generalised expression for linear patterns algebraically	O
22	AF	1b-3	write a generalised expression for quadratic patterns in words	O
23	AF	1b-4	write a generalised expression for quadratic patterns algebraically	O
24	AF	1b-5	write generalised expressions for exponential patterns in words	H
25	AF	1b-6	write generalised expressions for exponential patterns algebraically	H
26	AF	1c-1	categorise patterns as linear, non-linear, quadratic, and exponential	O
27	AF	1c-2	find difference (d) and first term (a) for a linear pattern	O
28	AF	1c-3	find first and second differences for a quadratic pattern	O
29	AF	1c-4	Find ratio (r) and differences ratio (r) for an exponential pattern	H
30	AF	7a	demonstrate understanding of a function	O
31	AF	7b-1	represent linear functions in tables - using x, f(x), y, domain, range, co-domain	O
32	AF	7b-2	represent linear functions graphically - using x, y, domain, range, co-domain	O
33	AF	7b-3	represent linear functions diagrammatically - using $f: x \mapsto y$, domain, range, co-domain	O
34	AF	7b-4	represent quadratic functions in tables - using x, f(x), y, domain, range, co-domain	O
35	AF	7b-5	represent quadratic functions graphically - using x, y, domain, range, co-domain	O
36	AF	7b-6	represent quadratic functions diagrammatically - using $f: x \mapsto y$, domain, range, co-domain	O
37	AF	7b-7	represent exponential functions in tables - using x, f(x), y, domain, range, co-domain	H
38	AF	7b-8	represent exponential functions graphically - using x, y, domain, range, co-domain	H
39	AF	7b-9	represent exponential functions diagrammatically - using $f: x \mapsto y$, domain, range, co-domain	H
40	AF	7b-10	represent linear functions in words	O
41	AF	7b-11	represent linear functions algebraically - using f(x) = ax + b	O
42	AF	7b-12	represent quadratic functions in words	O
43	AF	7b-13	represent quadratic functions algebraically - using f(x) = ax2 + bx + c	O
44	AF	7b-14	represent exponential functions in words	H
45	AF	7b-15	represent exponential functions algebraically - using f(x) = a2x and f(x) = a3x	H
46	AF	7d-1	interpret quadratic functions, including predicting the shape algebraically and identifying the turning point graphically	O
47	AF	7d-2	interpret exponential functions, including connecting rapid increase with variable as exponent and significance of point (1,0)	H

11. **The Learning Outcomes in the Mathematics Syllabus should be the main data source for a Domain Model.** *

Mark only one oval.

- ◯ Agree
- ◯ Neutral
- ◯ Disagree

12. **I understand the unpacking process from 6 to 45 Learning Outcomes having watched Screencast (Part 2 of 3).** *

Mark only one oval.

- ◯ Agree
- ◯ Neutral
- ◯ Disagree

13. **Which set of Learning Outcomes would you prefer in the New Syllabus?** *

Mark only one oval.

- ◯ Small number (6) - packed, with long text descriptions
- ◯ Larger number (45) - unpacked, with short text descriptions

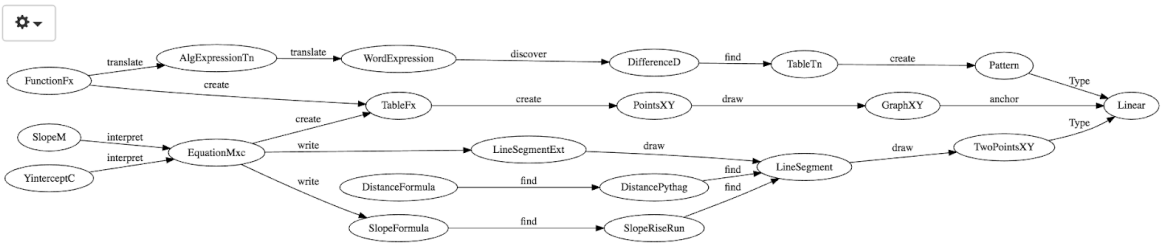
Domain Model (GAM Authoring Tool)

The design, development and evaluation of an adaptive learning domain model for post-primary mathematics.

Map of 23 Concepts

Add relation

Visual overview



14. **The visual display for this Domain Model is easy to understand.** *
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

15. **The concepts in this Domain Model are correctly sequenced.** *
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

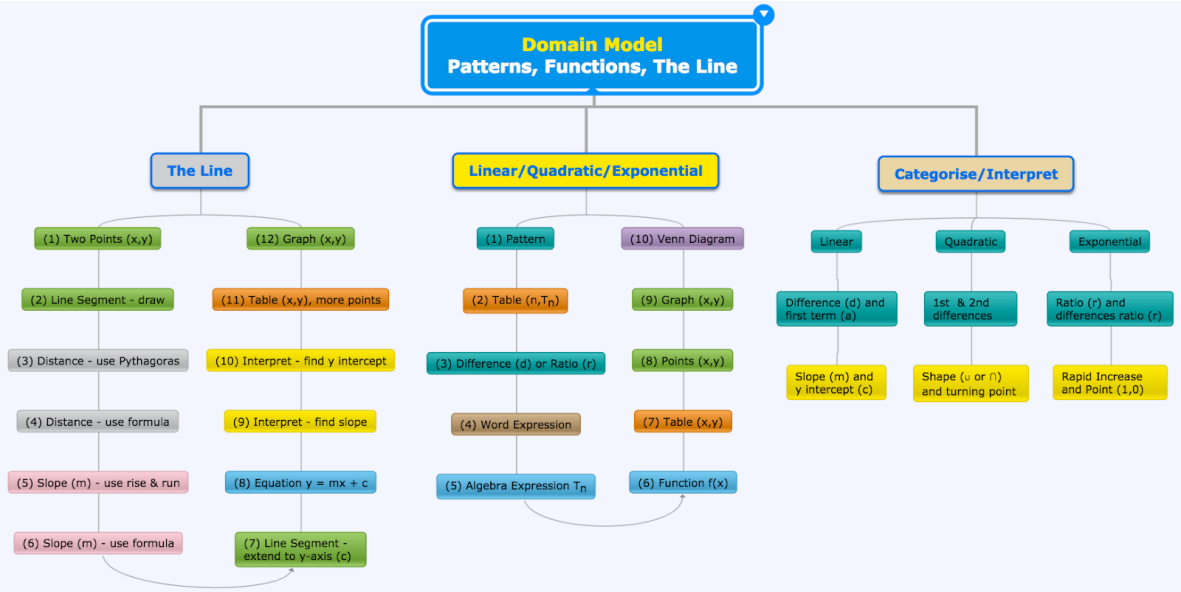
16. **The concepts in this Domain Model are correctly connected.** *
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Domain Model (Mindomo Organigram 1)

The design, development and evaluation of an adaptive learning domain model for post-primary mathematics.

Map of 23 Amalgamated Learning Outcomes (as Concepts)



17. **The visual display for this Domain Model is easy to understand.** *
Mark only one oval.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neutral
- ◯ Disagree
- ◯ Strongly Disagree

18. **The concepts in this Domain Model are correctly sequenced.** *
Mark only one oval.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neutral
- ◯ Disagree
- ◯ Strongly Disagree

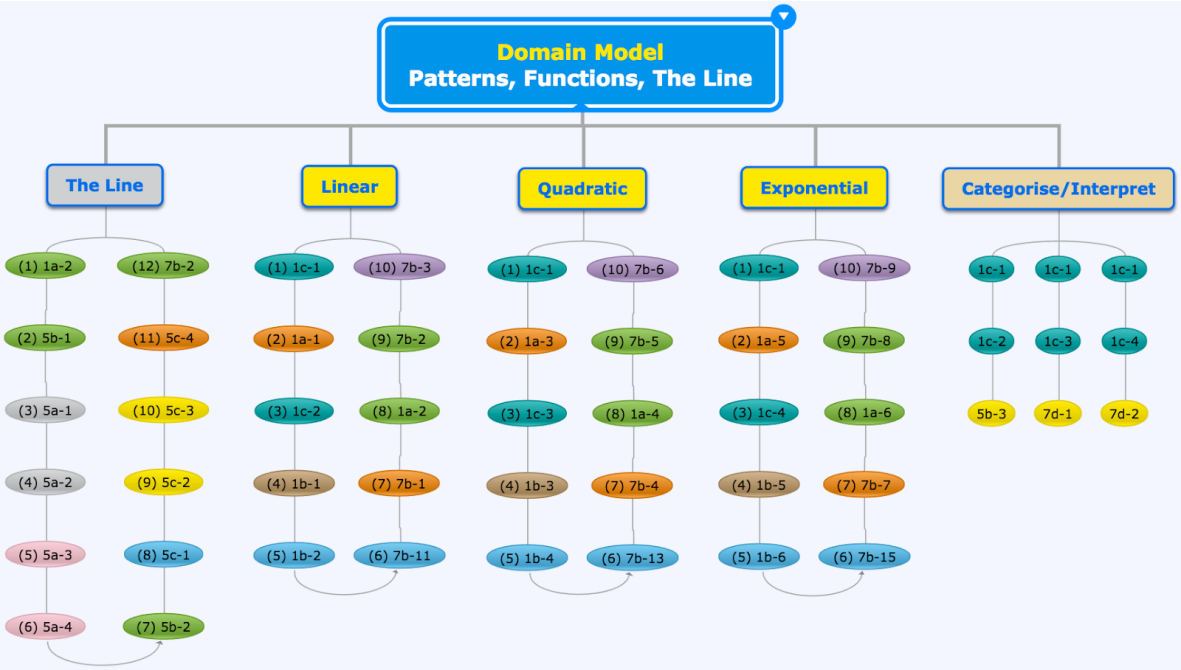
19. **The concepts in this Domain Model are correctly connected.** *
Mark only one oval.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neutral
- ◯ Disagree
- ◯ Strongly Disagree

Domain Model (Mindomo Organigram 2)

The design, development and evaluation of an adaptive learning domain model for post-primary mathematics.

Map of 45 Unpacked Learning Outcomes



Description of 45 Unpacked Learning Outcomes

	A	B	C	D
1	Strand	Outcome	Unpacked Learning Outcomes	Level
2				
3	GT	5a-1	find distance (slant), using Pythagoras theorem	O
4	GT	5a-2	find distance (slant), using formula	O
5	GT	5a-3	find and interpret slope, using rise and run	O
6	GT	5a-4	find slope, using formula	O
7	GT	5b-1	draw graphs of line segments	O
8	GT	5b-2	extend line to find y intercept graphically	O
9	GT	5b-3	interpret linear functions/line segments in context, including discussing rate of change (slope) and y intercept	O
10	GT	5c-1	find the equation of a line in the form y = mx + c	O
11	GT	5c-2	interpret the equation of a line in the form y = mx + c, including finding the slope	O
12	GT	5c-3	interpret the equation of a line in the form y = mx + c, including finding the y intercept	O
13	GT	5c-4	interpret the equation of a line in the form y = mx + c, including finding more points	O
14	AF	1a-1	represent linear patterns and relationship in tables	O
15	AF	1a-2	represent linear patterns and relationships in graphs	O
16	AF	1a-3	represent quadratic patterns and relationships in tables	O
17	AF	1a-4	represent quadratic patterns and relationships in graphs	O
18	AF	1a-5	represent exponential patterns and relationships in tables	O
19	AF	1a-6	represent exponential patterns and relationships in graphs	O
20	AF	1b-1	write a generalised expression for linear patterns in words	O
21	AF	1b-2	write a generalised expression for linear patterns algebraically	O
22	AF	1b-3	write a generalised expression for quadratic patterns in words	O
23	AF	1b-4	write a generalised expression for quadratic patterns algebraically	O
24	AF	1b-5	write generalised expressions for exponential patterns in words	H
25	AF	1b-6	write generalised expressions for exponential patterns algebraically	H
26	AF	1c-1	categorise patterns as linear, non-linear, quadratic, and exponential	O
27	AF	1c-2	find difference (d) and first term (a) for a linear pattern	O
28	AF	1c-3	find first and second differences for a quadratic pattern	O
29	AF	1c-4	Find ratio (r) and differences ratio (r) for an exponential pattern	H
30	AF	7a	demonstrate understanding of a function	O
31	AF	7b-1	represent linear functions in tables - using x, f(x), y, domain, range, co-domain	O
32	AF	7b-2	represent linear functions graphically - using x, y, domain, range, co-domain	O
33	AF	7b-3	represent linear functions diagrammatically - using $f: x \mapsto y$, domain, range, co-domain	O
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36	AF	7b-6	represent quadratic functions diagrammatically - using $f: x \mapsto y$, domain, range, co-domain	O
37	AF	7b-7	represent exponential functions in tables - using x, f(x), y, domain, range, co-domain	H
38	AF	7b-8	represent exponential functions graphically - using x, y, domain, range, co-domain	H
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43	AF	7b-13	represent quadratic functions algebraically - using f(x) = ax2 + bx + c	O
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45	AF	7b-15	represent exponential functions algebraically - using f(x) = a2x and f(x) = a3x	H
46	AF	7d-1	interpret quadratic functions, including predicting the shape algebraically and identifying the turning point graphically	O
47	AF	7d-2	interpret exponential functions, including connecting rapid increase with variable as exponent and significance of point (1,0)	H

20. **The visual display for this Domain Model is easy to understand.** *
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

21. **The learning outcomes in this Domain Model are correctly sequenced.** *
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

22. **The learning outcomes in this Domain Model are correctly connected.** *
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Domain Model (Excel Spreadsheet for Rhumbl)

The design, development and evaluation of an adaptive learning domain model for post-primary mathematics.

Building Connections (Relationships) between Topics and Learning Outcomes

	A	B	C	D	E	F	G	H	I	J	K	L
1	Instructions (Do not delete or modify this cell): In column A, list the name of topic. It must exactly match what you previously listed in the entities__topic worksheet, so we recommend you use the Excel = formula to reference the topic name. In row 1, list the the outcomes. Again, it needs to exactly match what is listed in the entities_learning outcome worksheet. Then, put a "1" if a topic addresses an outcome. E.g. put a "1" in Row 3, Column B if Topic 2 addresses Learning Outcome 1	5a-1 find distance (slant), using Pythagoras theorem	5a-2 find distance (slant), using formula	5a-3 find and interpret slope, using rise and run	5a-4 find slope, using formula	5b-1 draw graphs of line segments	5b-2 extend line to find y intercept graphically	5b-3 interpret linear functions/line segments in context, including discussing rate of change (slope) and y intercept	5c-1 find the equation of a line in the form y = mx + c	5c-2 interpret the equation of a line in the form y = mx + c, including finding the slope	5c-3 interpret the equation of a line in the form y = mx + c, including finding the y intercept	5c-4 interpret the equation of a line in the form y = mx + c, including finding more points
2	The Line	1	1	1	1	1	1		1	1	1	1
3	Linear Patterns & Functions											
4	Quadratic Patterns & Functions											
5	Exponential Patterns & Functions											
6	Categorise/Interpret Patterns & Functions							1				
7	Tables											
8	Graphs					1	1					
9	Venn Diagrams											
10	Algebraic Expressions (Linear)							1	1	1	1	1
11	Algebraic Expressions (Quadratic)											
12	Algebraic Expressions (Exponential)											

23. **This matrix of Topics and Learning Outcomes is easy to understand.** *

Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

24. **The Topics and Learning Outcomes are correctly connected.** *

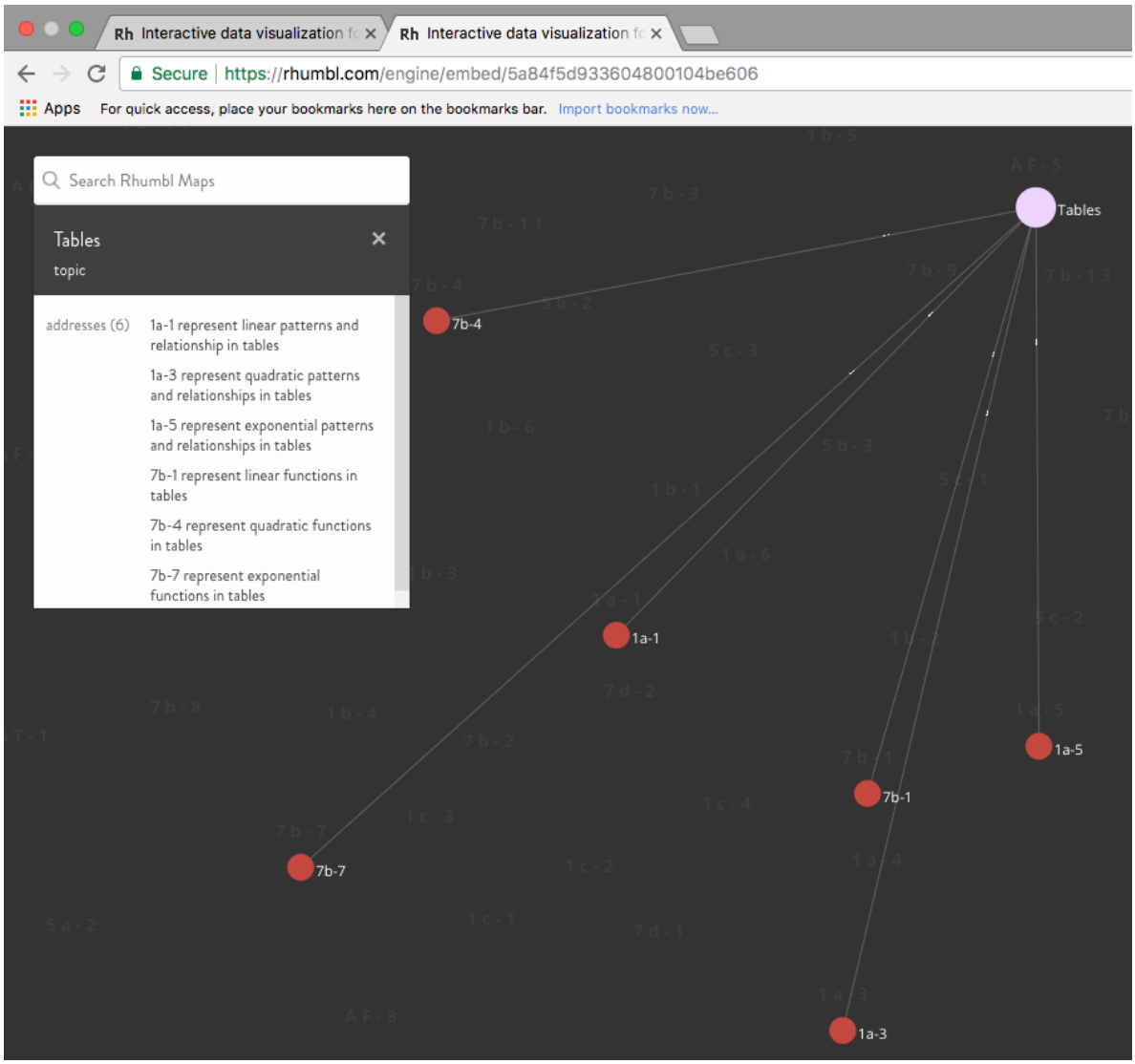
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

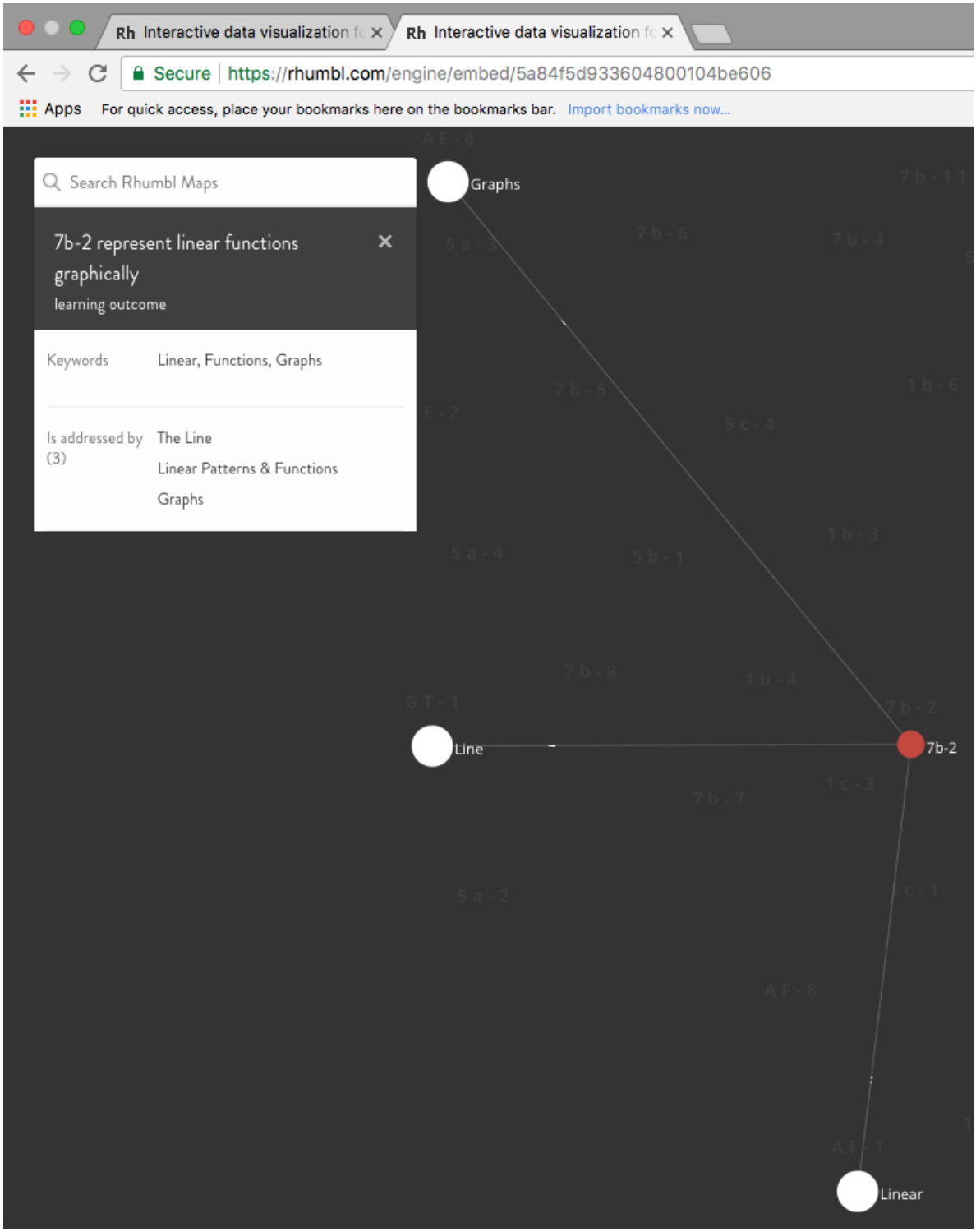
Domain Model (Rhumbl Map)

The design, development and evaluation of an adaptive learning domain model for post-primary mathematics.

Map View by Topic



Map View by Learning Outcome



25. **The map views for this Domain Model are easy to understand.** *
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

26. **The learning outcomes in this Domain Model are correctly connected.** *
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

27. **I prefer the following map view...** *
Mark only one oval.

- by Topic
- by Learning Outcome
- no preference

Learning Outcomes and Topics

The design, development and evaluation of an adaptive learning domain model for post-primary mathematics.

28. **Do you use the syllabus learning outcomes to teach Mathematics?** *
Mark only one oval.

- Always
- Sometimes
- Never

29. **Do you use textbook topics (chapters) and sub-topics (sections) to teach Mathematics?** *
Mark only one oval.

- Always
- Sometimes
- Never

Patterns and Functions

The design, development and evaluation of an adaptive learning domain model for post-primary mathematics.

30. **I already teach the connected concepts 'Patterns' and 'Functions' as a single topic.** *
Mark only one oval.

- Yes
- No

31. **I think that it is a good idea to teach 'Patterns and Functions' as a single topic using a unified set of learning outcomes.** *
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Sequencing and Connecting Concepts in Mathematics

The design, development and evaluation of an adaptive learning domain model for post-primary mathematics.

32. **It is important to teach Mathematics as a hierarchical system of sequenced concepts.** *
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

33. **It is important to teach Mathematics as a system of connected concepts.** *
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Future Adaptive Learning System for Post-Primary Mathematics

The design, development and evaluation of an adaptive learning domain model for post-primary mathematics.

34. **I think that a Domain Model is necessary to create an Adaptive Learning System for Mathematics.** *
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

35. **I think that an Adaptive Learning System, with a core Domain Model, could enhance the teaching and learning of Junior Cycle and Leaving Certificate Mathematics.** *
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

36. **I think that an Adaptive Learning System would be a more effective tool than a textbook for teaching Mathematics as a system of connected concepts.** *
Mark only one oval.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Comments and Suggestions (if any)

The design, development and evaluation of an adaptive learning domain model for post-primary mathematics.

37. **1.**

38. **2.**

39. **3.**

40. **4.**

41. **5.**