WESTERN SYDNEY UNIVERSITY

Moving a mathematics and statistics refresher program online

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MESH – Mathematics Education Support Hub - Western Sydney University

Western Sydney University - MESH

Western Sydney University

- Approximately 50,000 students and 81% of these undergraduates (2020).
- Multi – campus, across greater Sydney.
- Undergraduate students undertake diverse degree programs
- Many degree courses assume commencing students have some numeracy or mathematics background.

MESH (Mathematics Education Support Hub)

- Seven staff, most part-time, just over 5 full time equivalent.
- Work from three campuses.

Refresher program - Maths Start

- Free to students enrolled at Western Sydney University (WSU).
- Designed for students about to commence a unit (subject) that assumes some mathematical or statistical knowledge.
- Students commencing degree courses at WSU in business, engineering, science and health science as well as education make up the bulk of the Maths Start students.
- The workshops within the program are: Algebra 1 and 2, Trigonometry, Calculus and Statistics.
- The content is tailored to the requirements or assumptions of subjects at the university. Staff are aware of the requirements.
  - Expectations of the undergraduate courses are different.
  - Background of students attending are different.
  - Therefore pathway through Maths Start can be different for students.
- Content available via the Learning Management System.

Maths Start - 2020

- Fully face-to-face workshops.
  - Delivered over three weeks in February 9am – 3pm for:
    Algebra 1 , Algebra 2, Trigonometry, Calculus and Statistics.
- Classes held on one campus.
- Students were directed to the appropriate workshop(s) via a decision tree.
- Students asked to register for the workshops.
- Algebra 1 and 2 and Trigonometry had pre and post tests.
  - Pre-test, diagnostic and tool for sorting students into classes.
  - Staff could also access these results to determine areas of difficulty.
- Staff shared responsibility for different components of the program.

Maths Start - 2020

Face to face classes, team taught with two staff in the room for most sessions.

- Not all the material available is presented to all classes.
- The aim is not to just present the material but give students an opportunity to practice and progress when staff feel the students are able to understand the next topic etc.

Content is provided on a Maths Start Blackboard site.

- The teaching content is a set of pdf documents containing explanations, examples and exercises.
- All WSU students have access to the content provided on a Maths Start Blackboard site.

Teaching staff select material from this content to present to each class.

- Students can either print this or access it on a device during or after class.
- Static and available at all times.

Staff encourage students to attempt questions, make mistakes and learn from these.

Maths Start – Planning to move online

AIM

To deliver the content and support in a way that maintains all the good features of face-to-face delivery while adding some benefits that come from fully online delivery.

Factors to consider:

- Maintain the benefits of face-to-face.
  - Provide content to students so that it is tailored to their needs
  - Provide opportunity for students to practise and learn from mistakes
  - Personal contact, interaction with staff and other students
  - Opportunity for students to get feedback.
- Added benefits possible from online:
  - Opportunities for students to work through material at their own pace and at times most suitable to them.
  - Interactive
  - A useful Blackboard site throughout the year.

Decisions:

- Delivery of scheduled workshop sessions in February – via zoom
- Presentation of material on the Maths Start Blackboard site.

Maths Start – Process to moving online

- Started in October 2020
- All MESH staff involved
- Set up a wiki
- Determine how to provide synchronous and asynchronous classrooms.
- Agree on a structure and style of material on Blackboard site.
- Timeline set, to be ready for early Feb 2021
- Distribution of tasks between staff
- All staff worked on the first workshop, Algebra 1.
  So we could 'iron out' issues before applying structure and style to the presentation of material for the remaining workshops.
- Spreadsheets for each topic set up to record links to videos, online interactive learning visualisations and question sets to be used for revision.
- Writing 'Fast track' quizzes for each topic and some 'practise your skills' exercises for subtopics that include randomisation so students can learn from their mistakes using the mathematical e-assessment system Numbas
- Planning of scheduled sessions in February – via zoom

Maths Start – 2021

February workshops program

- Conducted over four weeks
- Each workshop:
  - delivered over one week (Statistics and Trigonometry concurrent)
  - started with an introductory ‘live’ zoom session (10am), recorded
  - later that day and following days – zoom help sessions at 3:30 pm, not recorded and students use breakout rooms, encouraged.

Blackboard content organisation

- Example of structure using Algebra 2
  - each lesson comprises a video and text based instruction
  - each sub-topic includes Practise Your Skills exercises, mostly in Numbas, with randomisation and feedback so that students can learn from their mistakes.

Three different ways to work

1. Systematically through the online resource folders (most students)

- [1.1] Algebraic expressions (review)
- [1.2] Using index laws and notation
- [1.3] Surds
- [1.4] Factorising algebraic expressions

2. Offline using the downloaded topic pdfs

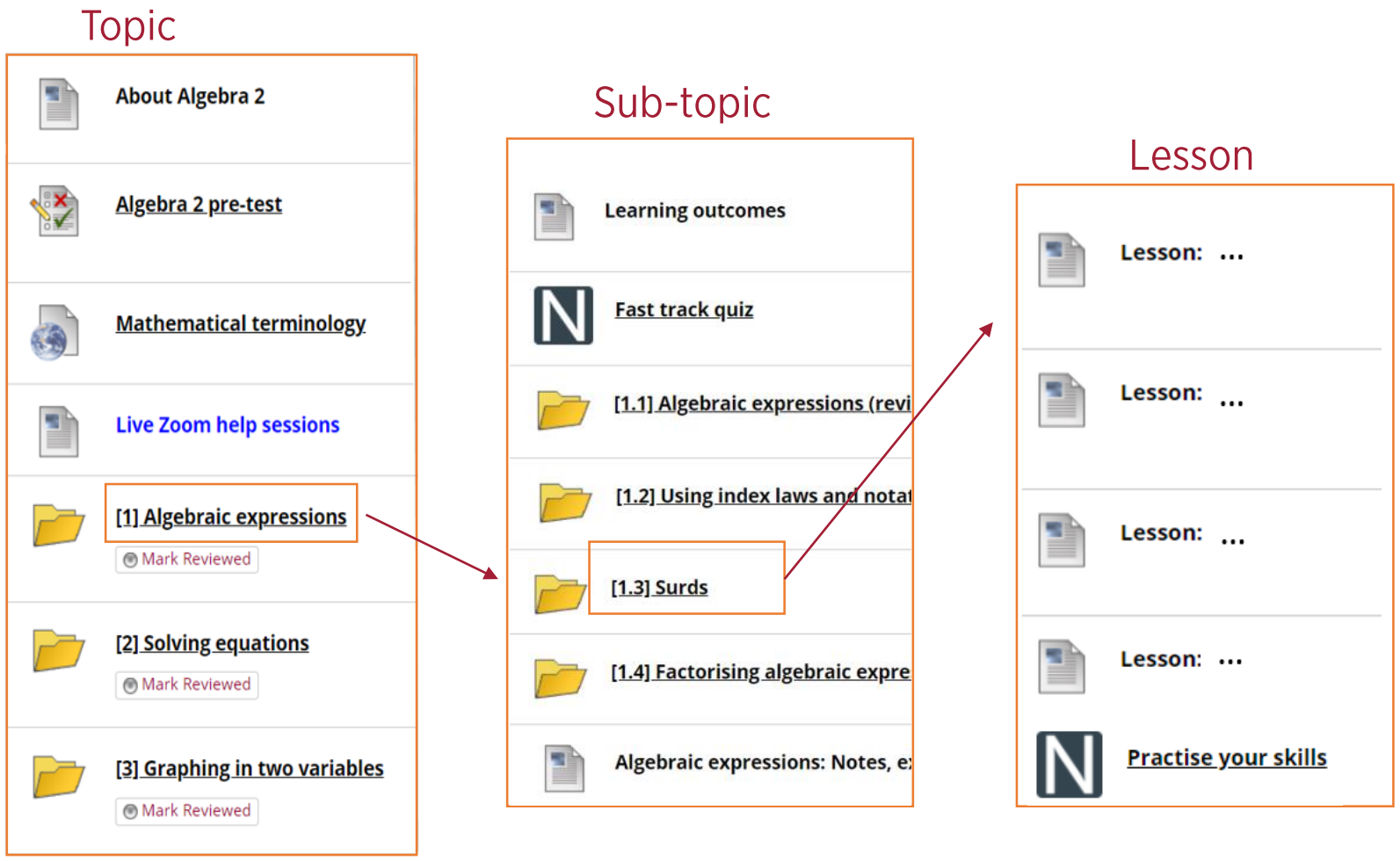
Algebraic expressions: Notes, examples and exercises

Maths Start Algebra 2 is usually a face-to-face course and includes a dc

3. Selectively using the Fast Track quizzes (only well prepared students)

Fast track quiz

Navigating Algebra 2 learning material



How to evaluate Maths Start 2021?

- Attendance – during the four weeks the workshops are conducted
  - Number of students
    - ? at zoom sessions
    - ? attempting the pre-test
    - ? attempting the fast track quiz
    - ? attempting the ‘Practice your skills’ – if in Numbas
  - Number accessing the Blackboard site? (very large site)
    - ? clicks on pages
    - ? time on pages
- Should we be measuring the activity on the Maths Start Blackboard site (vUWS) throughout the year?
  - If so, how frequently should this be reported?

Maths Start 2021 - Algebra 1 (first workshop)

- Attendance Algebra 1 2021 vs 2020

Algebra 1	2021	Zoom		2020
	5 days 6 sessions	>10 min	Total (any time)	3 days
Day 1	10 am	153	160	55
	3:30 pm	40	49	
Day 2	3:30 pm	17	26	44
Day 3	3:30 pm	14	18	33
Day 4	3:30 pm	14	16	
Day 5	3:30 pm	13	13	
Total unique		**175**		**100**

- Students were still working on the first workshop (Algebra 1) when the subsequent workshops were being conducted.

Maths Start 2021 – Pre and Post test attempts

as at Feb 19 2021

Quiz Name	Unique student attempts
Algebra 1 pre-test	292
Algebra 1 post-test	53
Algebra 2 pre-test	78
Algebra 2 post-test	23
Trigonometry pre-test	31
Trigonometry post-test	0

Maths Start 2021 - quiz attempts

Sample of attempts at Practise your skills and fast track quiz

Practise your skills: Integration by substitution	Created 21 Feb 2021, 4:21 p.m.	16 attempts.
Practise your skills: Definite integrals	Created 19 Feb 2021, 2:46 p.m.	18 attempts.
Practise your skills: Indefinite integrals	Created 19 Feb 2021, 2:38 p.m.	24 attempts.
Practise your skills (Practise your skills: The second and higher derivatives)	Created 17 Feb 2021, 5:10 p.m.	29 attempts.
Practise your skills (Practise your skills: Applications of differentiation)	Created 17 Feb 2021, 4:57 p.m.	25 attempts.
Practise your skills (Practise your skills: Exponential functions)	Created 17 Feb 2021, 2:11 p.m.	26 attempts.
Practise your skills (Practise your skills: The sum, product and chain rules)	Created 17 Feb 2021, 1:39 p.m.	40 attempts.
Practise your skills (Practise your skills: Derivatives of some standard functions)	Created 17 Feb 2021, 1:33 p.m.	68 attempts.
Fast track quiz (Fast track quiz: Radian measure)	Created 16 Feb 2021, 11:38 p.m.	8 attempts.
Practise your skills (Practise your skills: Arc length)	Created 16 Feb 2021, 10:59 p.m.	9 attempts.
Practise your skills (Practise your skills: graphs of trigonometric functions in radians)	Created 16 Feb 2021, 10:34 p.m.	7 attempts.
Practise your skills (Practise your skills: solving trigonometric equations in radians)	Created 16 Feb 2021, 10:25 p.m.	14 attempts.
Fast track quiz (Fast track quiz: Angles greater than 90 degrees)	Created 14 Feb 2021, 4:49 p.m.	11 attempts.
Practise your skills (Practise your skills: Exact ratios)	Created 13 Feb 2021, 4:22 p.m.	33 attempts.
Practise your skills (Practise your skills: 5 The Normal distribution)	Created 13 Feb 2021, 2:15 p.m.	34 attempts.
Practise your skills (Practise your skills: 3 Frequency distributions)	Created 13 Feb 2021, 2:13 p.m.	30 attempts.
Practise your skills (Practise your skills: 2.3 Five-number summary v2)	Created 13 Feb 2021, 2:12 p.m.	26 attempts.
Practise your skills (Practise your skills: 2.2 Measures of spread)	Created 13 Feb 2021, 2:11 p.m.	36 attempts.
Practise your skills (Practise your skills: 1 Variables and data)	Created 13 Feb 2021, 2:07 p.m.	87 attempts.

Maths Start 2021 - data

Maths Start vUWS (Blackboard) site usage

Subject Activity in Hours feb 1 - 18	Subject Activity in Hours feb 19 - 21	Subject Activity in Hours feb 22 - 28	Total time (hrs)	Hits	Avg mins per hit
84.19111167	36.75527833	33.55	154.49639	1418	6.537223836
62.57027833	49.95722167	37.36555667	149.8930567	903	9.959671539
40.735835	47.233055	40.85111	128.82	977	7.911156602
70.87139167	21.214445	18.47611167	110.5619483	972	6.824811626
53.57250333	26.63277833	20.785	100.9902817	1045	5.798485072
60.36028	17.64888833	16.16527667	94.174445	1118	5.054084705
36.75583	34.175	19.95861	90.88944	893	6.106793281
27.54833167	33.20666667	25.65277833	86.40777667	666	7.784484384
36.845	22.17	21.41444333	80.42944333	770	6.267229351
20.68722167	31.55278	28.13916833	80.37917	610	7.906147869
36.14750167	22.79999833	17.73194333	76.67944333	892	5.15781009
66.873055	6.675835	0	73.54889	845	5.222406391
38.96278167	13.77527833	7.586945	60.325005	1072	3.376399534
17.10167	19.71944333	19.71527667	56.53639	304	11.15849803
32.82999833	13.39611167	6.281111667	52.50722167	700	4.500619
33.77222333	12.39166833	4.099723333	50.263615	1025	2.94226039
24.25055833	12.51527667	12.51527667	49.28111167	468	6.318091239
44.39999667	2.331666667	2.331666667	49.06333	846	3.479668794
44.33555333	2.263333333	2.2625	48.86138667	864	3.393151852
47.38138667	0.001666667	0	47.38305333	489	5.813871575
40.2125	0.005555	0.005555	40.22361	342	7.056773684
21.63416667	13.176665	4.98	39.79083167	855	2.792339064

Maths Start 2021 - data

Student use, by time of day, of Maths Start vUWS site Feb 1 – 7,

1 | fx | Access / Hour of Day

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q

Access / Hour of Day

Hour of Day	Hits	Per cent
0	922	2.02%
1	587	1.28%
2	176	0.38%
3	175	0.38%
4	94	0.21%
5	170	0.37%
6	286	0.63%
7	560	1.22%
8	931	2.03%
9	2000	4.37%
10	4145	9.06%
11	3811	8.33%
12	3412	7.46%
13	2966	6.48%
14	3391	7.41%
15	3311	7.24%
16	3504	7.66%
17	2887	6.31%
18	2471	5.40%
19	2430	5.31%
20	2192	4.79%
21	2417	5.28%
22	1899	4.15%
23	1017	2.22%
	45754	