

16th International Conference on Learning
Barcelona, Spain
1-4 July 2009

The Perceptions of Students' Workload in Science at a New Zealand Polytechnic

Victor Fester

Adam McMillan

Waikato Institute of Technology

Hamilton

New Zealand

victor.fester@wintec.ac.nz



Wintec

WAIKATO INSTITUTE OF TECHNOLOGY

Te Kuratini o Waikato

Building a stronger community through education, research and career development



<http://www.mapsofworld.com/world-political-map.htm>

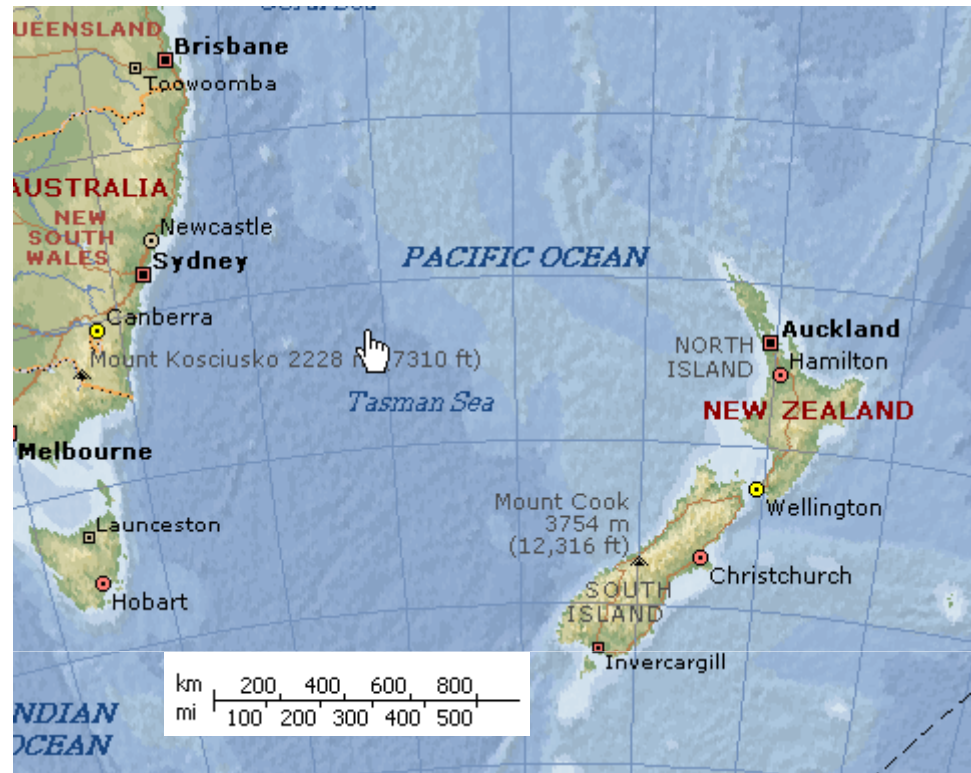


Wintec

WAIKATO INSTITUTE OF TECHNOLOGY

Te Kuratini o Waikato

Building a stronger community through education, research and career development



http://encarta.msn.com/map_701510375/australasia.html

Building a stronger community through education, research and career development



Wintec

WAIKATO INSTITUTE OF TECHNOLOGY

Te Kuratini o Waikato

- Hamilton population ca. 130 000
- Cambridge population ca. 16 000
- I live in Cambridge, about 25 km from Hamilton
- Waikato region – dairy industry
- Cambridge and surrounds – race-horse breeding



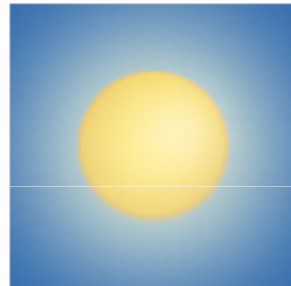
It's summer in Spain!

Spain > Barcelona

▼ Five-day Outlook

Last updated at 21:35 on Thursday 2nd July
All times are CEST (Europe/Madrid, GMT+0200)

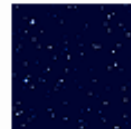
Friday



Sunny

Max: 30°C
Wind: SSE 7mph
Hum: 32%
Press: 1014mB
Vis: Poor
Sunrise: 06:22

Fri. Night



Clear Sky

Min: 22°C
Sunset: 21:28

Saturday



Sunny

Max: 29°C
Sunrise: 06:23

Sunday



Heavy Rain Shower

Max: 29°C
Sunrise: 06:24

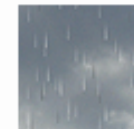
Monday



Thundery Shower

Max: 27°C
Sunrise: 06:24

Tuesday



Light Rain

Max: 27°C
Sunrise: 06:25



Wintec

WAIKATO INSTITUTE OF TECHNOLOGY

Te Kuratini o Waikato

Building a stronger community through education, research and career development

It's winter in New Zealand!!

Hamilton Weather Forecast Hamilton



Today	Sat 4	Sun 5	Mon 6
Few Showers	Rain	Few Showers	Showers
16° 5°	15° 9°	14° 5°	14° 5°

http://www.nzherald.co.nz/hamilton/weather/forecast.cfm?c_id=10&weatheritem=83

Building a stronger community through education, research and career development



Wintec

WAIKATO INSTITUTE OF TECHNOLOGY

Te Kuratini o Waikato

It's winter in New Zealand!!



Building a stronger community through education, research and career development



Wintec

WAIKATO INSTITUTE OF TECHNOLOGY

Te Kuratini o Waikato

Rationale for Pilot Study

"Science viewed as difficult, hard work, time-consuming"

- Do instructors and students agree with this notion?

"Learning outside the 'classroom' is very important"

- How much time do students spend on learning outside the 'classroom'? Is this anywhere near the expected 75h?
- Self-directed study activities (SDSA)
- How much time do students devote to different SDSAs?
- How can instructors assist students to better manage their workload?



Wintec

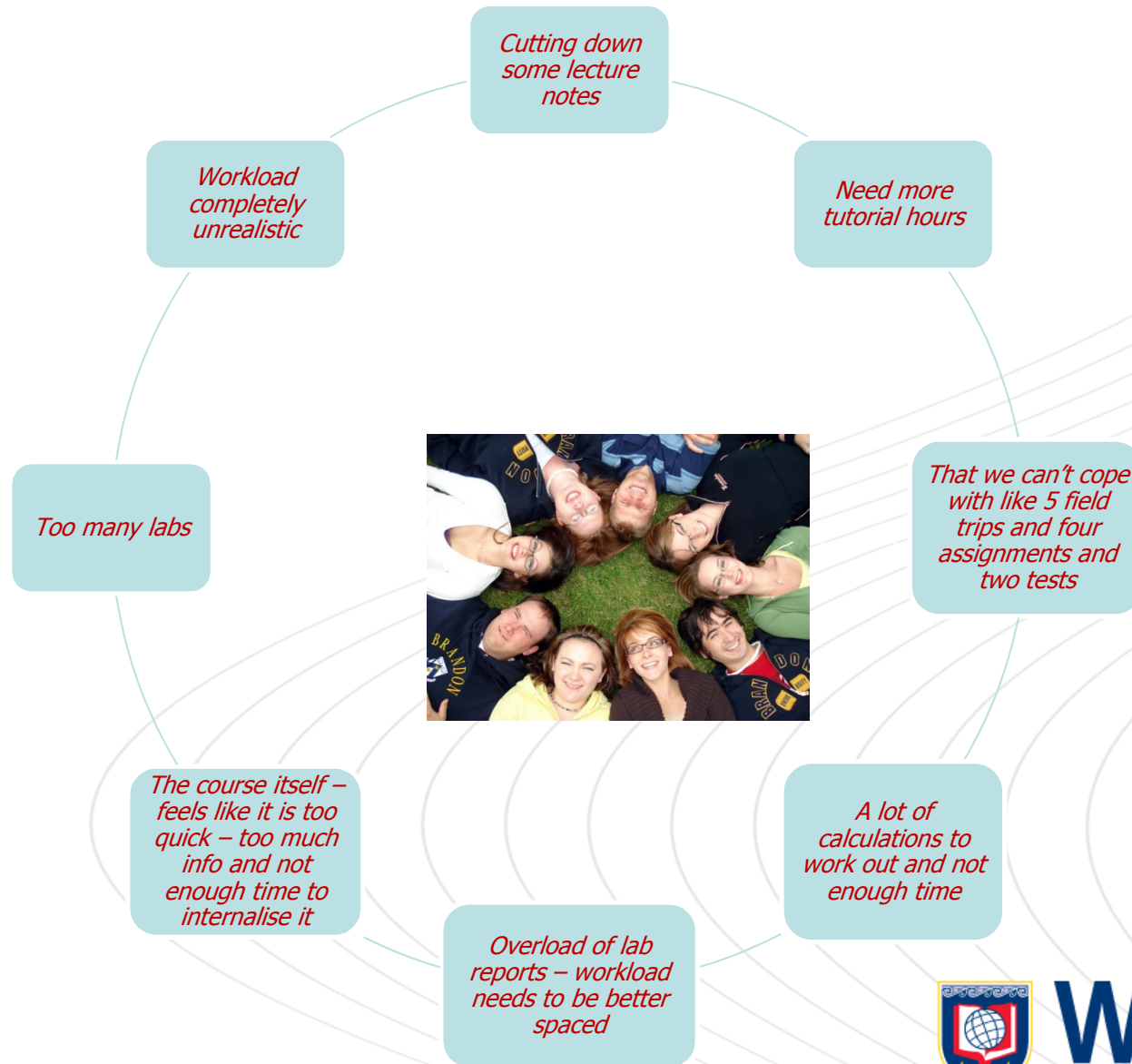
WAIKATO INSTITUTE OF TECHNOLOGY

Te Kuratini o Waikato

Some important points from the literature

- "...manifestation of a perceived heavy workload is a feeling in the form of pressure or stress" (Kember, 2004)
- "...significant correlations between surface approach and both class hours attended and independent study time" (Kember et al, 1995)
- "Hours per week spent studying or doing homework produces the largest and most numerous partial correlations with student outcomes [after controlling for confounding variables] ... hours spent studying is positively related to almost all academic outcomes ... Hours per week spent attending classes or labs has many fewer associations with student outcomes...' (Astin, 1993)
- "Actual workload is a concept which is difficult to measure with any precision." (Kember & Leung, 1998)
- "A large majority of undergraduates describe particular activities outside the classroom as profoundly affecting their academic performance. Some point to study techniques, such as working in small groups outside of class." (Light, 2001)

Comments from Student Evaluations of Teaching



The pilot study

- Selected modules in a 2-year science diploma for laboratory technicians
- Two Yr 2 modules (Semester 1, 2009)
 - Yr 2 Chemistry and Yr 2 Biology
- Two Yr 1 modules (Semester 2, 2009)
 - Yr 1 Chemistry and Yr 1 Biology

The pilot study

- All 16 modules in the diploma worth 15 credits
- 15 credits = 150 hours of 'learning'
- Wintec programme curriculum documents
 - 75 TTH and 75 SDSA
- Instructors have no idea how much time students devote to SDSA
- This presentation reports on research done in two Yr 2 modules (Semester 1, 2009)
 - Yr 2 Chemistry and Yr 2 Biology
 - N=18 for Chemistry, N=10 for Biology

Data Collection

- Qualitative and quantitative
- Initial interview with instructors
- Regular short meetings with instructors
- Time log sheets collected from students over 19 weeks
- Pre-module (wk 1) and post-module (wk 17) questionnaires
- Interviews with selected students
- Module and curriculum documentation



Eight categories of SDSAs

using Moodle, then enter your time as 35(10) in the appropriate box
write in the time as 35.



Activity	Mon- 16/21
1 Reading before lectures/labs	
2 Revision of lecture/lab material	
3 Preparation, discussion and completion of assignment/presentation	
4 General discussion of material with other students	
5 General discussion of material with tutor	
6 Writing up lab reports/field trip reports	
7 Studying for lab tests	
8 Studying for theory tests and exams	



- Categories decided after initial consultation with instructors
- Time log sheets filled out by each student for each of 19 weeks



Wintec

WAIKATO INSTITUTE OF TECHNOLOGY

Te Kuratini o Waikato

Initial interviews with instructors

- Yr 2 Chemistry

"The assignment is going to be quite time-demanding and I think they will have to put quite a fair bit of time into looking for information for the assignment ."

"...there are quite a lot of new concepts they have to familiarise themselves with and the fact that they have to start thinking for themselves, so they have to start doing a lot more by themselves."

"Yes, it is probably the most demanding."

- Rated both content and students' time commitment as difficult

Initial interviews with instructors

- Yr 2 Biology
- Rated students' time commitments as difficult, but content as moderate

"For some students it wouldn't take them as long because there's not as much learning because this is basic understanding and then if they've got that or if they've cottoned on it pretty quickly, then there's not as much as other modules."

"New Zealand's unique as far as conservation goes and you've been brought up with it then even if you don't believe in it, or you haven't had much to do with the environment, as a person growing up in New Zealand you still would've had this conservation stuff hammering away at you in the background regardless of however you've grown up, but in other countries they don't, you know, conservation is just something that's never ever considered, so, yeah, those students have a real problem with this module. And there's a lot of them in this class."



Pre-module and post-module questionnaire data: Yr 2 Biology

1 = no time

2 = some time

3 = a moderate amount of time

4 = plenty of time

5 = excessive time



Activity	Rating (% of students, N=10)									
	1		2		3		4		5	
A = pre-module B = post-module	A	B	A	B	A	B	A	B	A	B
Reading before lectures / labs	40	30	50	40	10	20	0	10	0	0
Revision of lecture / lab material	0	10	20	30	40	30	40	30	0	0
Preparation, discussion and completion of assignment / presentation	0	0	10	30	0	20	60	30	30	20
General discussion of material with other students	0	0	30	60	50	20	20	10	0	10
General discussion of material with tutor	10	20	40	40	30	30	20	0	0	10
Writing up lab reports / field trip reports	0	0	0	0	0	30	40	30	60	40
Studying for lab tests (no lab tests for this module)	100									
Studying for theory tests and exams	0	0	0	0	0	10	50	20	50	70



= instructor's perceptions

Building a stronger community through education, research and career development



Wintec

WAIKATO INSTITUTE OF TECHNOLOGY

Te Kuratini o Waikato

Pre-module and post-module questionnaire data: Yr 2 Biology

- Instructor expected students to spend 'plenty of time' in two of the SDSAs:
 - Revision of lecture / lab material
 - Writing up field trip reports
- Only 30% of students indicated that they spent 'plenty of time' or 'excessive time' on 'Revision of lecture / lab material'
- 70% of students indicated that they spent 'plenty of time' or 'excessive time' on 'Writing up field trip reports'
- 70% of students indicated that they spent 'plenty of time' or 'excessive time' on 'Studying for theory tests and exams' – tutor thought that they would only devote a 'moderate amount of time'

Pre-module and post-module questionnaire data: Yr 2 Chemistry

1 = no time

2 = some time

3 = a moderate amount of time

4 = plenty of time

5 = excessive time



Activity	Rating (% of students, N=18)									
	1		2		3		4		5	
A = pre-module B = post-module	A	B	A	B	A	B	A	B	A	B
Reading before lectures / labs	33	28	44	56	17	11	6	6	0	0
Revision of lecture / lab material	0	6	11	39	61	50	28	6	0	0
Preparation, discussion and completion of assignment / presentation	0	17	17	28	33	39	39	11	11	6
General discussion of material with other students	17	17	50	39	17	22	11	22	6	0
General discussion of material with tutor	11	6	33	39	56	22	0	22	0	0
Writing up lab reports / field trip reports	0	0	0	6	33	28	44	39	22	28
Studying for lab tests	0	11	6	6	50	39	22	33	22	11
Studying for theory tests and exams	0	0	6	6	11	39	39	22	44	33



= instructor's perceptions

Building a stronger community through education, research and career development



Wintec

WAIKATO INSTITUTE OF TECHNOLOGY

Te Kuratini o Waikato

Pre-module and post-module questionnaire data: Yr 2 Chemistry

- Instructor expected students to spend 'plenty of time' in three of the SDSAs:
 - Revision of lecture / lab material
 - Preparation, discussion and completion of assignment / presentation
 - Studying for theory tests and exams

Pre-module and post-module questionnaire data: Yr 2 Chemistry

- Only 8% of students indicated that they spent 'plenty of time' or 'excessive time' on 'Revision of lecture / lab material'
- Only 17% of students indicated that they spent 'plenty of time' or 'excessive time' on 'Preparation, discussion and completion of assignment / presentation'
- 55% of students indicated that they spent 'plenty of time' or 'excessive time' on 'Studying for theory tests and exams'
- 57% of students indicated that they spent 'plenty of time' or 'excessive time' on 'Writing up practical reports' – instructor expected a moderate amount of time
- 44% of students indicated that they spent 'plenty of time' or 'excessive time' on 'Studying for lab tests' – instructor expected a moderate amount of time

Pre-module and post-module questionnaire data: Yr 2 Chemistry

- 22% of students expected that time commitment to SDSAs would be 'difficult' or 'very difficult'
- 17% actually reported that time commitment to SDSAs was 'difficult' or 'very difficult'
- 56% thought that the time demands were 'just right' and 22% 'more than expected'
- 28% thought that this module was more difficult than other modules in the programme

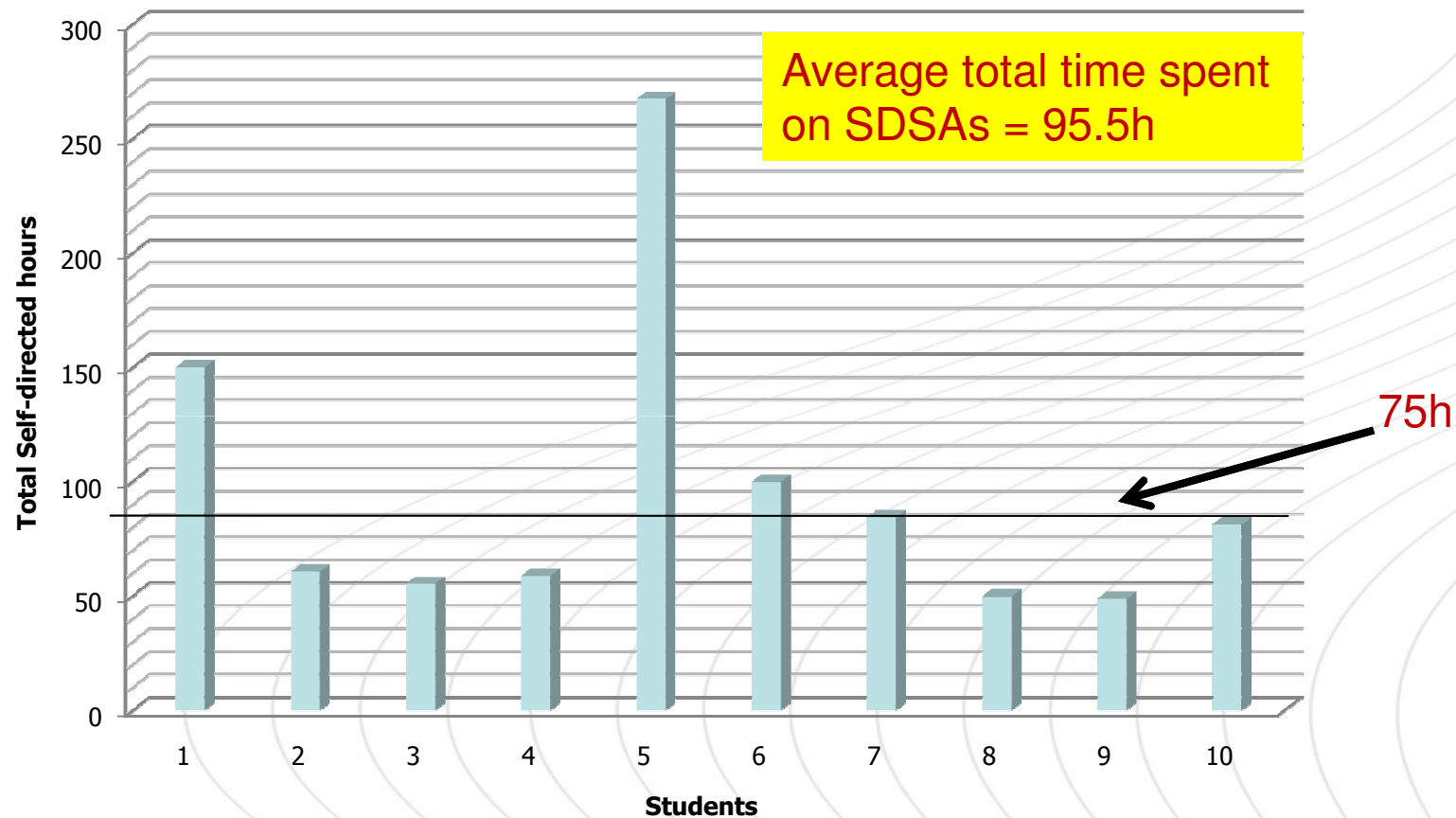
Pre-module and post-module questionnaire data: Yr 2 Biology

- 50% of students expected that time commitment to SDSAs would be 'difficult' or 'very difficult'
- 30% actually reported that time commitment to SDSAs was 'difficult' or 'very difficult'
- 70% thought that the time demands were 'just right' and 20% 'more than expected'
- 20% thought that this module was more difficult than other modules in the programme

General Observations

- There is a mismatch between instructors' and students' expectations w.r.t. time spent on some SDSAs
- Students seem to spend much time on assessable tasks – 'learning' driven by assessment

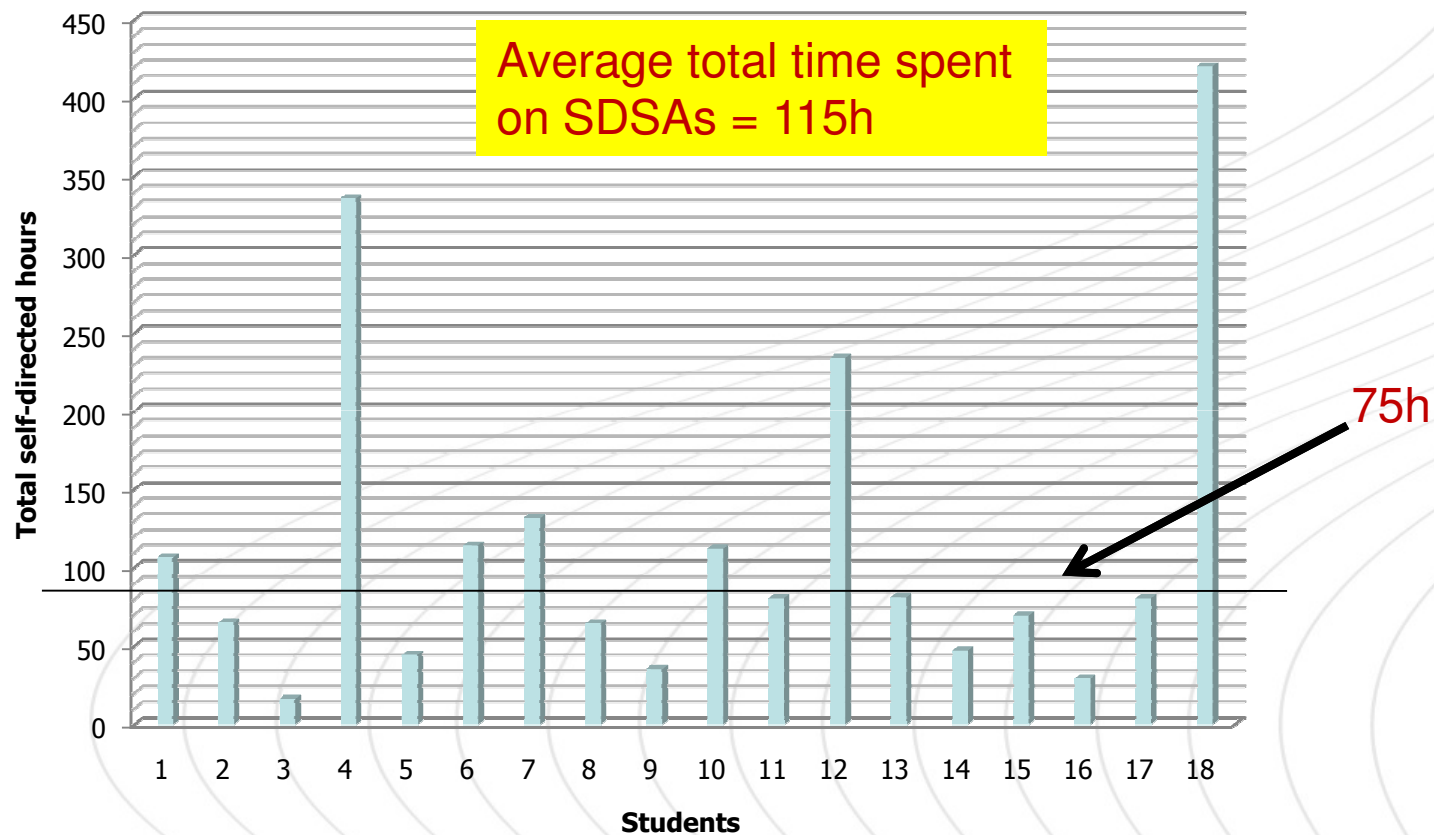
Individual students' total self-directed hours: Yr 2 Biology



N=10, EAL=9



Individual students' total self-directed hours: Yr 2 Chemistry



N=18, EAL=14

From interviews with students with 'excessive' total hours -reasons

My age is a factor, but my goal is that I want to graduate. I am serious about learning and I am proudly looking forward to graduating.

I like to search for information straight away after classes and I do this in a number of ways. Firstly, I have high-speed Internet (broadband) at home, for which I pay \$90 per month, together with my telephone. I use the internet to search for information. Next, I use the library and , finally, I speak to the tutor – I prefer face-to-face contact with her.

The field trip reports were most time-consuming. Initially, I found the report-writing frightening, and I do a lot of research beforehand to help with the writing.

The lab reports were most time-consuming. Every week there is one report to hand in. I do a lot of research beforehand to help with the writing.



From interviews with students with 'excessive' total hours -reasons

One way of helping me to understand the laboratory sessions better is the use of the Google search engine. I use Google to find picture and information of the instrumentation before each lab session – this is also very time-consuming. I notice that even first language speakers [i.e. those who have English as a first language] cannot understand lab instructions because they would not have seen the instrument before entering the lab.

With this particular paper it's actually the first time I've done analytical chemistry and I, sort of, want more time to get around some stuff by myself rather than around some other students because sometimes I get confused, I did, I want to understand more by myself before I go to other students, so, yeah.

Lab reports, yeah, they take lots of my time for this paper.

From interviews with students with 'excessive' total hours - reasons

Probably I can complete in about two days or a day – it depends on the questions, what's in there. [lab report]

Those questions you have to find which the answers. I think sometimes on the Internet, like that.

Why? Because I like chemistry, I like spend much time in front of computer and then looking for the interesting topic. That maybe it is not given from our tutor, so it's just for my knowledge, so like I, when I'm answering the questions for lab report like that I like searching from internet and then so I can get the information more deeply instead of answering question, but I just like spending time in front of computer and then oh! OK! This is what they mean the question and, yeah, I answer the question, so, yeah.

From interviews with students with 'excessive' total hours - reasons

I read from the book, from the library and I sometime just see lecture from YouTube, so it's spend my time so I can then from, well I don't understand this part and then just go to Google and YouTube from that part and then there is a lecture.

Sometimes, sometimes, so, I searching using my language, if I Google the question or I try to find out the answer I just go to Google Indonesia site, yes, and I compare to the English.

So it's like www.google.co.id instead of co.nz

From interviews with students with 'excessive' total hours – common characteristics

- EAL students
- Mature students with families
- Strong reliance on the Internet as additional resource
- All appear to learn for understanding – 'deep' rather 'surface' learners
- Participate more in discussion with other students

From interviews with students with 'excessive' total hours – their suggestions

I think it's practical, it needs more, because we learn about instruments.

Oh, like I said probably more assistants in the lab would be ...

Tutorials also would be good, 'cause we don't have tutorials.

The tutor should help students to understand the concept of report-writing, how to structure a report. The tutor should also make clear what is expected of students in the report.

From interviews with students with 'excessive' total hours – their suggestions

The tutor should also spend more time on calculations and we should also discuss these with other students online. Converting from one unit to another and diluting problems should also be discussed more. I find it difficult converting units, finding unknown concentrations and calculating dilution factors.

Another suggestion for the tutor is to use pictures and diagrams in class when talking about flame photometry, columns, etc. It is good to use more pictures, for second language students, especially. [i.e. those who do not have English as a first language]

using Moodle, then enter your time as 35(10) in the appropriate box
write in the time as 35.



No	Activity	Mon 16/21
1	Reading before lectures/labs	
2	Revision of lecture/lab material	
3	Preparation, discussion and completion of assignment/presentation	
4	General discussion of material with other students	
5	General discussion of material with tutor	
6	Writing up lab reports/field trip reports	
7	Studying for lab tests	
8	Studying for theory tests and exams	



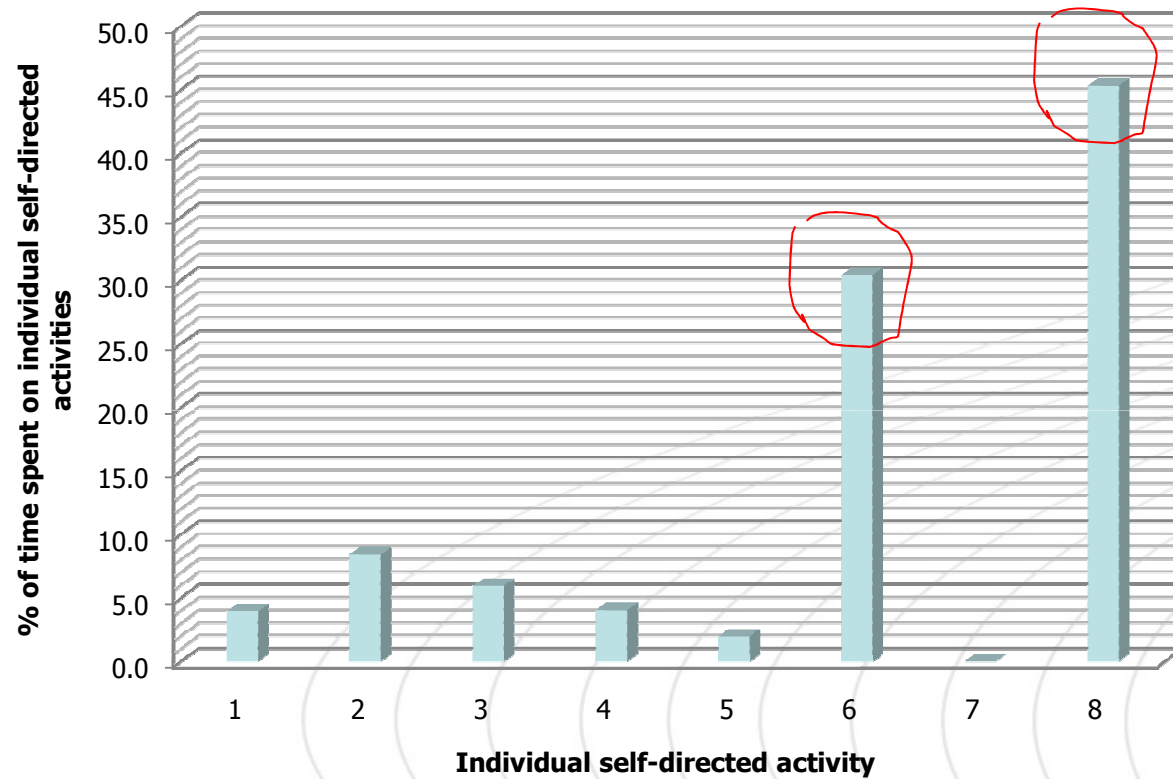
Wintec

WAIKATO INSTITUTE OF TECHNOLOGY

Te Kuratini o Waikato

Building a stronger community through education, research and career development

% Time devoted to SDSAs: Yr 2 Biology



Activity	% Time
1	3.9
2	8.4
3	5.9
4	4.0
5	2.0
6	30.4
7	0.0
8	45.3

% Time devoted to SDSAs: Yr 2 Chemistry



Wintec

WAIKATO INSTITUTE OF TECHNOLOGY

Te Kuratini o Waikato

Building a stronger community through education, research and career development

Assessment Weightings vs. % Student Time

Yr 2 Biology			Yr 2 Chemistry		
Assessment	Weighting	% Student Time	Assessment	Weighting	% Student Time
Field trip reports	40%	30.4%	Lab reports	20%	25.8%
Tests	20%	45.3%	Tests	25%	37.6%
Final examination	40%		Final Examination	40%	
			Assignment	5%	13.2%
			Lab test	10%	4.3%

General Observations

- Students appear to devote most of their time preparing for summative assessments
- Individual efforts – studying, reports, assignment
- Most time devoted to
 - Studying for class tests and examination
 - Preparing lab/field trip reports
- Peak activity in SDSAs near due dates for assessments
- Students devote very little time to discussion with other students and the instructor
 - 6% of time in Biology
 - 3.2% of time in Chemistry

Recommendations to instructors

- Explore ways of spreading student workload
- Introduce collaborative assessment tasks
 - Use peer and self-assessment
 - Accountable group work
- Reduce weighting of final examination
- Foster environment of discussion and participation
- Use activities that encourage 'deep' learning
- Incorporate students' suggestions for easing workload
- Students not particularly concerned about workload in these two modules, although time demands in Chemistry are much higher
 - e.g. review lab report format
- Adjust weighting of Chemistry assignment

Further work

- Semester 2 – repeat with two Yr 1 modules
- Follow-up interviews with students
- One-on-one sessions with instructors to discuss and implement changes
 - e.g. review format of lab reports (e.g. McMorran, et al. 2009)
 - review contact hours (TTH) – reduction or rearrangement?
 - Increase use of online learning – increase interactivity
- Carry out statistical analysis of quantitative results

References

- Astin, A.W. (1993). *What matters in college?* San Francisco: Jossey-Bass.
- Kember, D. (2004). Interpreting student workload and the factors which shape students' perceptions of their workload. *Studies in Higher Education*, 29(2).
- Kember, D., Jamieson, Q., Pomfret, M., & Wong, E.T.T. (1995). Learning approaches, study time and academic performance. *Higher Education*, 29.
- Kember, D., & Leung, D.Y.P. (1998). Influences upon students' perceptions of workload. *Educational Psychology*, 18(3).
- McMorran, D., Warren, D., & Souness, R. (2009). Bringing enquiry-based learning to the first-year laboratory: Experimenting with conducting polymers. *Chemistry in New Zealand*, 73(2).
- Light, R.J. (2001). *Making the most of college: Students speak their minds.* Cambridge, Massachusetts: Harvard University Press.

Thank you for your attention!



e-mail: victor.fester@wintec.ac.nz

Building a stronger community through education, research and career development



Wintec

WAIKATO INSTITUTE OF TECHNOLOGY

Te Kuratini o Waikato