

THE ONLINE PROGRAMMING CHALLENGE

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Setting the Scene

Information Technology is ubiquitous in modern society, which presents both advantages but also challenges when teaching it as an academic discipline. In our experience teaching university and high school students we identified a number of problems:

- . School students in remote and rural Australia often lack access to people with sufficient expertise in modern computing.
- 2. Learning programming requires **regular feedback** to correct errors and most undergraduate courses have limited supervised laboratory and tutorial hours.
- 3. Marking code submitted for assignments and exams is time con**suming** and difficult to do without running the programs and testing their output.

Students are enthusiastic adopters of new technology, so with this in mind we developed the Challenge website, an online environment for learning programming. The Challenge site also provides support for assessment submission, marking, and online student communities.

THE UNIVERSITY OF SYDNEY	INFO1903: Informatics (Adv) – 2010 <u>Tara Murphy</u>		
1 Home			
M Problems	Banana Madness Solution Back This story appeared in New Scientist's Feedback page on April 2nd, 2005: Solution Back		
General Edit Problems	AND here's one of those dedicated pieces of research for which New Scientist readers are so renowned. John Blyth was feeling bored so he started a Google search by adding a reduplicative syllable to the word banana, and then another, and then another. He got about 9,450,000 hits for banana itself, about 3960 for bananana, about 2840 for banananana, about 1530 for bananananana, and so on down to two		
D Edit Files	for bananananananananananananananananananan		
Edit Code	Here is an example interaction between your program and the user:		
User Groups	Enter the word: banana Enter the repeat length: 2 Enter the repeat count: 3		
Courses	banananana That is, the last two letters are <i>removed</i> , then <i>repeated</i> three times.		
😧 Logout	Here is another example interaction: Enter the word: apple Enter the repeat length: 3 Enter the repeat count: 4 applepleple		
	In this case, the last three letters are removed, then repeated four times.		
	Image: Provide the system Provide the system Provide		
	Answer:		
	<pre>word = raw_input('Enter the word: ') length = int(raw_input('Enter the repeat length:')) count = int(raw_input('Enter the repeat count: ')) print word[:-length] + word[-length:] * count</pre>		

The Students

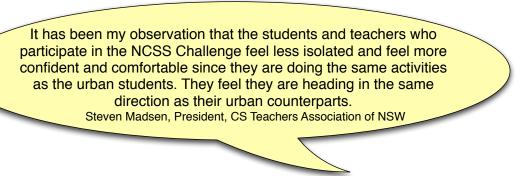


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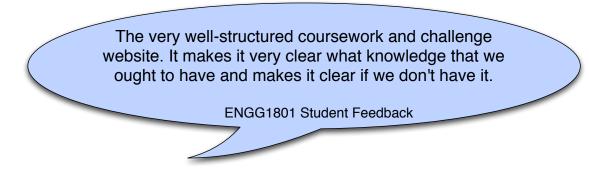
Figure 1: A typical beginners question used in INFO1903 and the NCSS Challenge which are both run in the **Python** programming language.

We have developed this system with several student groups in mind:

• Advanced First Year Students — The Challenge site allows us to provide many practice questions and extension activities for our top IT students in INFO1903 Informatics (Advanced).



• High School Students — Each year 1500 students from around Australia participate in our NCSS online programming challenge which uses the site.



• First Year Engineering Students — We rolled out the Challenge site for use with MATLAB for 750 engineering students doing ENGG1801 Engineering Computing.

THE UNIVERSITY OF SYDNEY	ENG	GG1801: Engineering Computing – 2010 <u>Tara Murphy</u>
Home		
Problems	Calculate averages Write a program that asks for a vector and calculates the average of the item	Solution Back ns in the vector using a for loop.
Edit Problems	Your program should work like this:	
	Enter a vector: [1 2 3 4 5 10] Average = 4.167	
Edit Files	displaying the average to 4 significant figures.	
Edit Code	Answer:	
Surveys	<pre>vector = input('Enter a vector: '); sum = 0; for x = vector sum = sum + x; end</pre>	
User Groups	<pre>average = sum/length(vector); disp(['Average = ', num2str(average, 4)]);</pre>	
Help		
Courses		
Logout		Direck Answer
	This submission passed our automatic testing Your submission was:	Submitted at 04:36PM 20/07/10
	<pre>vector = input('Enter a vector: '); sum = 0; for x = vector sum = sum + x; end average = sum/length(vector); disp(['Average = ', num2str(average, 4)]);</pre>	
	Test cases: <pre> testing vector = [1 2 3 4 5 10] (example case): passed testing vector = [1 2 3 4 5]: passed </pre>	<u> </u>

Figure 2: A typical engineering question in MATLAB from ENGG1801. Students receive immediate feedback on their solutions.

A Resource for Education Research

The Challenge site also helps us to learn about teaching programming. We now have a database of

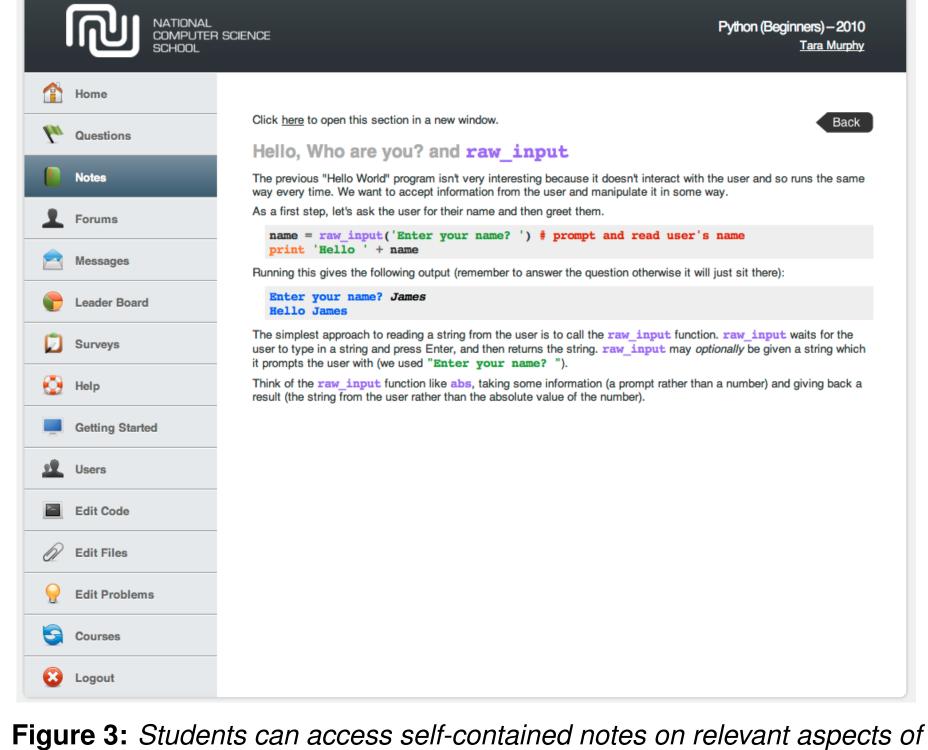
- Over 200 000 student submissions

This database includes 73 unique incorrect solutions to the classic program "Hello World". Analysis of this data will help us understand common programming misconceptions. We estimate that the feedback high school students received through the online challenge is equivalent to over 5000 hours of teacher time.

Acknowledgments

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• Over 20 000 forum posts about programming problems

each module. Teachers can print these and use them as an in-class resource.