Article

Female student participation in New Zealand universities: Forty years on

Paul Stock[1], David Penny[1], and Ema Alter[2]
[1]Institute of Fundamental Sciences, Massey University, Palmerston North, New Zealand
[2]National Centre for Teaching & Learning, Massey University, Palmerston North, New Zealand

Abstract

New Zealand universities have always had the same access for both male and female students, but over the last 100 years the proportion of females was initially about one-third, falling to around 25% in the 1950s. From the mid-1960s, it rose around 1% a year until females now outnumber male students - and graduates. However, the numbers of Masters and PhD degrees increased more slowly, and slower still has been the increase in the more senior academic appointments. There is considerable difference in science graduates, depending on discipline (e.g. biology cf. physics and veterinary cf. engineering).

Introduction

New Zealand universities are interesting in that they have officially always had open access, irrespective of gender. However, when they were founded in 1869 a few classes were initially restricted to males. Only after a memorandum 'signed by 149 ladies' in 1871 were women admitted to all classes (1). This open access policy for females is perhaps not so widely known; better known is the fact that women were allowed to vote in Parliamentary elections in 1893 (2).

In 1973-74 the New Zealand Parliament held a 'Women's Rights Select Committee' (WRSC), and the early results of female participation in New Zealand universities were submitted at that time (3). Since the publication of the report of that landmark committee, the presence of women in New Zealand universities (and in life in New Zealand more generally) has continued to be observed and recorded. Particular attention has been paid to the position of females as academics. For instance, the Wilson Report in 1986 (4) – whose author was to go on to become President of the New Zealand Labour Party, Minister of Justice, and Speaker of the House – explored the status of academic women in New Zealand universities. Wilson returned to the theme a decade later, contrasting the noticeable increase in the number of women employed in junior academic positions between 1986 and 1996, with the relative absence of women in senior positions (5). More recently still, the Human Rights Commission's New Zealand Census of Women's Participation (6) notes that women now constitute almost a quarter of senior academic staff (albeit that progress varies across individual institutions).

While these and other sources provide a general sense of the progress being made by women academics, the matter of the participation of women in New Zealand universities remains in need of updating. In this article we do this by using statistical information from the New Zealand Ministry of Education over the last four decades (7), including female student participation in the Sciences.

*Correspondence: P.A.Stock@massey.ac.nz

Paul Stock is a Senior Tutor in the Institute of Fundamental Sciences. He began teaching large 100-levels classes in 2000 and was intrigued by the high proportion of female students in biology subjects (Fig S2), which led to his interest in quantifying trends in female participation at university.

David Penny was a contributor to the 1974 submission on Women in higher education to the New Zealand Parliament. He has been a Professor of Theoretical biology for several decades, and has maintained an active interest in the rights of women at university. David is a past president of the New Zealand Association of Scientists.

Ema Alter is a Course Evaluation Coordinator at the National Centre for Teaching & Learning and foundation committee member of Women@Massey, a forum open to all academic and professional women working at Massey University.

Results

In Figure 1 we update the annual female enrolment percentages from 1900 to the present (the figures are for all New Zealand universities combined). These results show that initially from the year 1900 about 35% of enrolments were female, though the total numbers are relatively small, and so there is some fluctuation from year to year. The next significant observation is an increase in the percentage of females attending university during the First World War. At that time males were drafted and sent overseas; some males survived the war and came back, leading to the dip in female percentage enrolments from about 1920. After an initial increase during the 1920s, there is another drop during the Great Depression. This decrease is apparently the result of some 'family decisions' at that time – maybe because of financial limitations – to prioritise supporting their young males through universities. Indeed, a mother-in-law of one of the people involved in the original 1974 submission said that she 'shed a few tears', remembering that her family (living in very hard times) decided to not send their young females to university during the Depression. Whatever the reasons, the effect of the Depression is quite noticeable on female enrolment. Again there are relatively more female enrolments during the Second World War when males are sent overseas; and a decrease later when males (who survived and came back) attended universities.

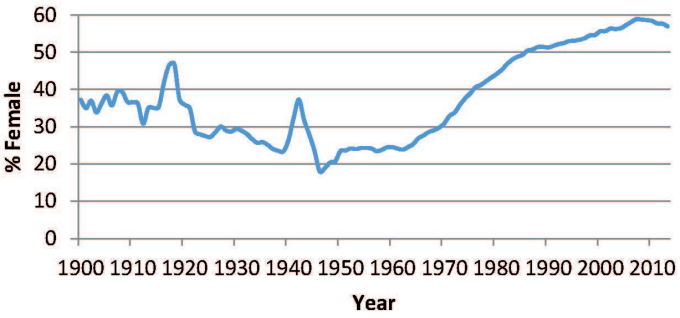

Figure 1. Percentage of female enrolment in New Zealand universities from 1900 to the present.

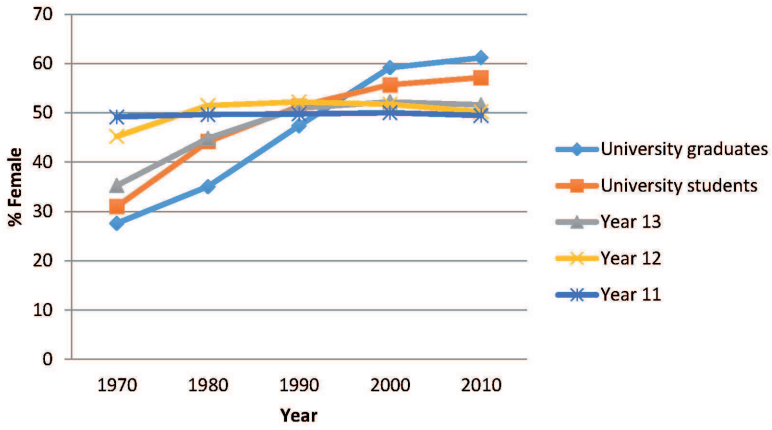

Figure 2. Upper high school and university enrolment 1970-2010, at decade intervals.

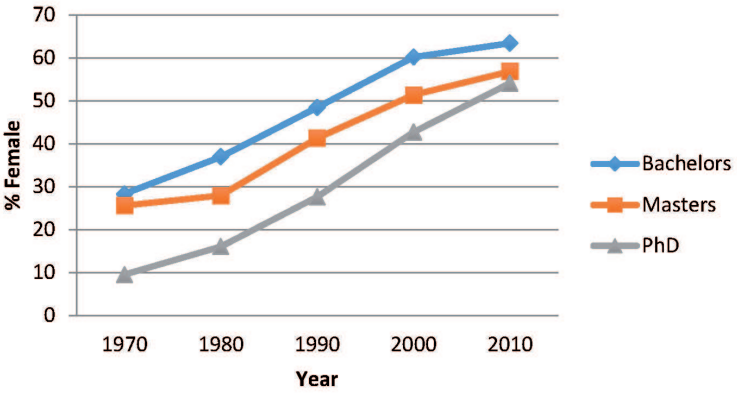

Figure 3. Percentage of bachelor, masters and PhD degrees awarded 1970–2010, at decade intervals.

The next feature is the relatively low numbers of females in the 1950s, marking the lowest sustained level of female participation at universities for the 20th century. This time corresponds to the post World War II baby boom in New Zealand that peaked in 1961 (8). Women married young and focused on raising children – an average of four per family (9). The 1960s brought winds of social change, in which traditional views of the role of women were challenged (9). From the mid-1960s there was a steady increase of c. 1% a year in female enrolments at university, reaching 50% in 1986. Since then numbers have increased at a slower rate but have climbed to 57% of current enrolments.

In order to better understand these figures it is necessary to consider the last three years of high school, university enrolments, and graduates; these are represented in 10-year intervals from 1970 (Figure 2). The Year 11 numbers are essentially control values; it is not until Year 12 that a tentative decision is made to go on to university education. In 1970, female enrolments in Year 12 were lower than for males, but a decade later they exceeded them. Year 13, the final year of high school before going on to university, shows a significant increase from 1970 to 1980, and there is an increase that continues until 1990. The university enrolment figures are the same as for Figure 1, and the last set of figures is for actual percentages of graduating students. The figure shows an increase from just fewer than 30% in 1970, and increases every decade until it is now just over 60% – certainly a significant change. So now the numbers of female graduates exceed male graduates.

Illustrating the trends still further are the percentage of Bachelor, Masters and PhD degrees over the same time periods, and these are shown in Figure 3. Not surprisingly, the percentage of Bachelor degrees is similar to those shown in Figure 2 – most degrees are Bachelor degrees. The Masters degrees are perhaps more interesting, and show a relatively high level in 1970 (nearly 30%), with a steady increase every decade. Perhaps the most informative set of figures are the doctoral degrees; surprisingly, only 10% of PhD graduates are female in 1970, but subsequently this increases dramatically and is over 50% by 2010. This is important in the sense that this degree is normally the minimal requirement for entry into university research-informed teaching and so naturally flows into the question of female academic positions.

As far as academic positions are concerned, the New Zealand universities function under an English system where the usual steps are Lecturer, Senior Lecturer, Associate Professor, and Professor. There are also other teaching positions (e.g. Tutor and Senior Tutor), also

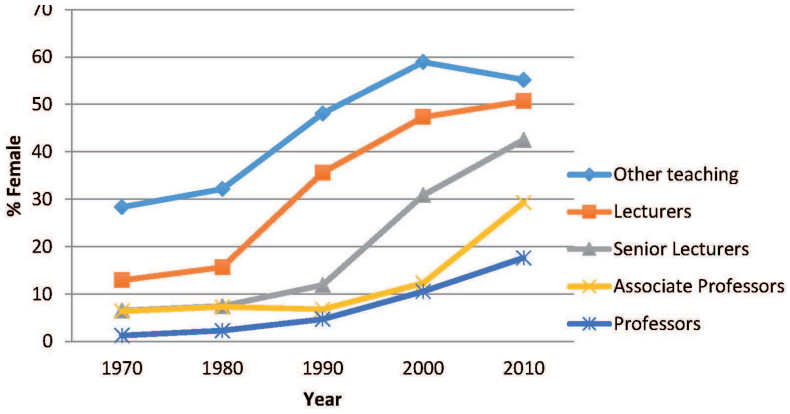

Figure 4. Percentage of full-time staff at different levels 1970-2010, at decade intervals.

shown in Figure 4. The differences are greater for the higher levels of staffing positions, but are they tending to even out over time? Most professors will have served as lecturers and senior lecturers for 20 years or more, so a lag phase regarding female representation in academia after the rise in female enrolments since the 1960s is not unexpected. Figure 4 shows that female representation has risen significantly since 1980. However, there is a separate issue of how long male and female academics spend on the intermediate positions before moving to the next level, but that is outside the figures we are presenting here. The percentage of part-time staff (Figure S1) shows there has been a stronger female contribution for many years, though similar trends are evident, and there may even be some advantage towards female lecturers among part-time staff.

Certainly, there are differences between subjects/disciplines. Figures 5a–d show the percentage of science degrees awarded to females in New Zealand by decade (note for technical reasons associated with databases, there are some years that the times are changed to 2002 and 2012). 1970 shows relatively high numbers of basic science degree completions by females in biology, modest completions for chemistry (including biochemistry) and maths (including statistics), and rather low completions in physics. From 1980 and onwards there are strong positive trends in the female proportion of degree completions in these four basic science disciplines. Most striking is the increased representation of females in PhD completions in the basic/fundamental sciences in recent decades (but still rather low in physics). It is not just the sciences where there has been increase, figure 5d shows that it occurs in the applied sciences of medicine, engineering, veterinary science, and agricultural science as well – even though the engineering enrolment is still relatively low for females.

An interesting and important question is whether these changes in female participation and in degrees conferred are going to lead to greater employment in the university sector, and whether there is going to eventually be 'equality' (in the sense of equal employment).

Discussion

It would be naïve to suggest any one single interpretation of the data. Many factors are involved, and a dynamic picture is essential to understand the changes. It is certainly not at all useful to take a static picture of just one time period and argue from there. Many factors, or social drivers, are involved, be they cultural, social, political or economic, and we have mentioned only some of them in relation to significant changes in the 1960s regarding the role of women in New Zealand society. In what ways are gender expectations still a factor? Discrimination by men against women attaining positions of leadership in academia is suggested (10–12), though it is unclear to what extent

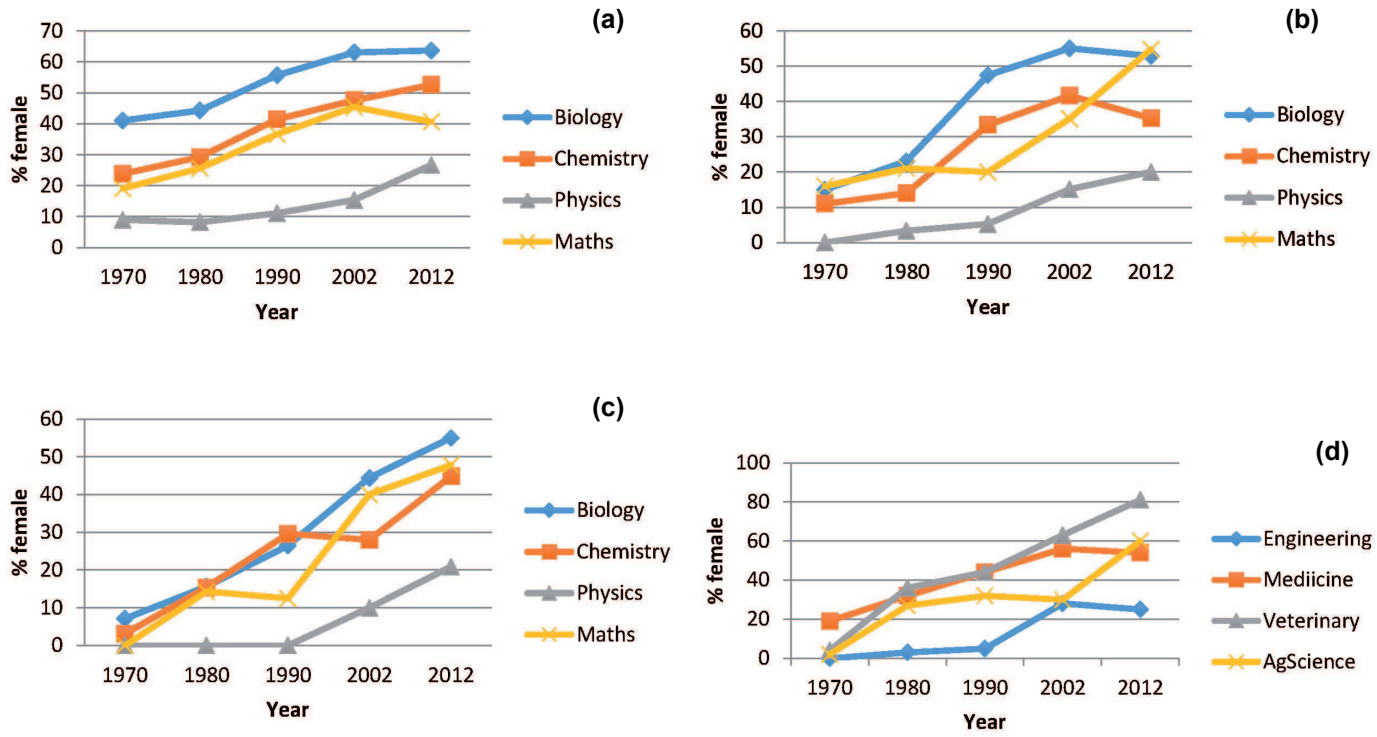

Figure 5 Percentage of (a) Bachelors, (b) Masters, (c) PhD degrees awarded to females in four science areas 1970-2012 at decade intervals, (d) Bachelors degrees awarded to several applied sciences. Detailed records were not available for 2000, so data from 2002 and 2012 were used to provide decade intervals. Chemistry includes biochemistry.

females prefer female supervisors (13). Other authors report that females tend to be preferred (about two-fold) when equal CVs are sent to potential academic employers (14).

Similar results in recent work by the European commission shows there is still a marked 'scissors effect' where female representation at senior academic levels is lower than that for males (15). However, these are generally based on static, not dynamic, analyses. Sturm *et al.* (16) also report that many females think they are not as good managers as perhaps they really are. Such expectations can work in more than one direction: one distinguished New Zealand female faculty member first appointed in the 1940s, was rather hostile to married women wanting to combine a university career with family responsibilities. 'I made my choice' she would say. It was relatively easy for younger females to object that 'males did not have to make any such choice', but was that really helpful advice to younger, aspiring female academics? Are such attitudes largely historical or do negative expectations of women in higher education still persist? A 12-page advertising feature by AcademiaNet in a recent issue of *Nature* discussed unconscious gender bias and its possible role in the low representation of women in science, technology, engineering, and maths (STEM) fields (17). However, it still presented a static, rather than a dynamic, view. In reality, there are many social drivers, and it is essential to always have a dynamic view of the changes through time. We cannot stress too highly the need to take a dynamic view.

Similarly, we do not know where the evolution in female participation at university will end. Perhaps there are two rather extreme positions along a spectrum of views. The first might be the view that everything is 'environmental', and will eventually balance out. Such a picture might suggest that 'the males lead the way', and that over the long term, female enrolments might eventually drop to 50% - aligning with a Fisherian 1:1 sex ratio. A second 'sociobiological' view (18) might suggest that the female over-representation will continue, and will eventually lead to female domination of universities. However, we would just insist here that we are presenting the data, not making predictions about the future. The major points we would make as a result of our work are the continued positive trends in female participation at New Zealand universities in the last 40 years, and the importance of taking a dynamic view of this change through time. And we should accept that none of us know where the proportions will end up in the future.

Materials and Methods

For 1970–1990, data was sourced from New Zealand Education Statistics booklets from the Massey University library in Palmerston North. For 2000 and 2010 electronic resources were downloaded from Education Statistics of New Zealand http://www.educationcounts.govt.nz/statistics). There was some specific data not present in online publications for 2000 and 2010 that was furnished on request (see acknowledgements). Statistics for Massey University College of Science enrolments from 2001-2013 was collated from the Massey University Headcount & EFTS Management Information (HEMI) database.

Acknowledgments

We particularly thank Mr Gurusingham Sathiyandra from the Ministry of Education for providing electronic data from the last two decades.

Supplementary figures

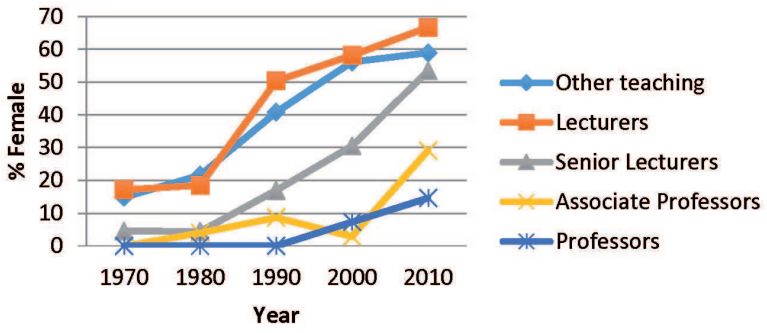

Figure S1. Percentage of part-time staff at different levels 1970 -2010 at decade intervals.

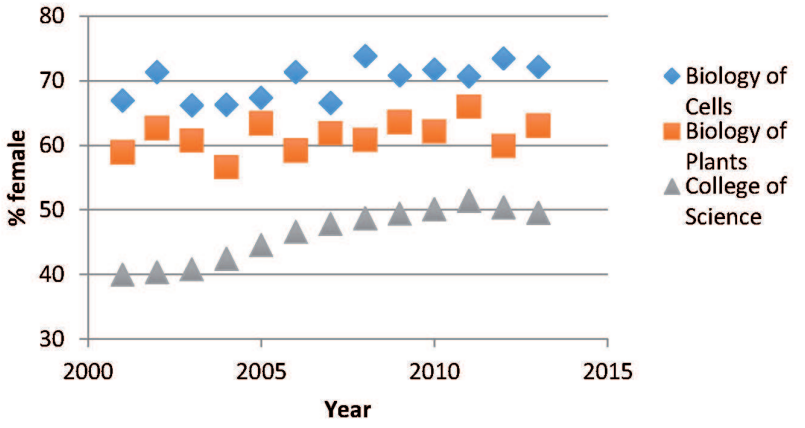

Figure S2 Percentage female enrolments at Massey University for 162.101 Biology of Cells, 120.101 Biology of Plants, College of Science total enrolments from 2001 to 2013.

References

1. The Encyclopedia of New Zealand. 2014. *Dalrymple, Learmonth White*. Retrieved from http://www.teara.govt.nz/en/biographies/1d2/dalrymple-learmonth-white
2. New Zealand History. 2014. *Women and the vote*. Retrieved from http://www.nzhistory.net.nz/politics/womens-suffrage/brief-history
3. Bunkle, P.; Chick, N; Glass, A.D.M.; Glass, M.: Gordon, M.E.; Penny, E.D.; Penny, P.E; Perley, D.R.; Perley, J.E.; Wells J.E. 1974. *Women in Higher Education – submission to the Women's Rights Select Committee of the New Zealand House of Representatives*.
4. Wilson, M. 1986 *Report on the Status of Academic Women in New Zealand.* Wellington: Association of University Teachers Inc.
5. McDonald, G. 1996. Twenty Years On: Looking at Gender Equality. *New Zealand Annual Review of Education* 5: 121–135.
6. Human Rights Commission. 2012. *The New Zealand Census of Women's Participation.* Wellington: Human Rights Commission.
7. Education Statistics of New Zealand, 1970–2010 (hard copy and electronic records).
8. Statistics New Zealand. 2014. *Changing face of New Zealand's population*. Retrieved from http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/changing-face-of-nzs-population.aspx
9. The Encyclopedia of New Zealand. 2014. *Families: a history*. Retrieved from http://www.teara.govt.nz/en/families-a-history
10. Pyke, J. 2013. Women, choice and promotion or why women are still a minority in the professoriate. *Journal of Higher Education Policy and Management* 35(4): 444–454.
11. Fara, P. 2014. A temporary liberation. *Nature* 511: 25–27.
12. Reubena, E.; Sapienzab, P.; Zingales, L. 2014. How stereotypes impair women's careers in science. *Proceedings of the National Academy of Science USA*. 111: 4403–4408.
13. Sheltzera, J.M.; Smith, J.C. 2014. Elite male faculty in the life sciences employ fewer women. *Proceedings of the National Academy of Science* USA. 111: 10107–10112.
14. Williams, W.M.; Ceci, S.J. 2015. National hiring experiments reveal 2:1 faculty preference for women on STEM track tenure. *Proceedings of the National Academy of Science USA* 112: *1418878112*.
15. European Commission, *She Figures 2012*. pages 86-89, Retrieved from http://ec.europa.eu/research/science-society/document_library/pdf_06/she-figures-2012_en.pdf
16. Sturm, R.E.; Taylor, S.N.; Atwater, L.E.; Braddy, P.W. 2013. Leader self-awareness: An examination and implications of women's under-prediction. *Journal of Organizational Behavior* 35: 657–677.
17. Tschol, I.W.; Rehak, K.; Roth, E. 2014. No More Excuses! Leading women in science. *Nature* 7522: Advertising Feature.
18. Wilson, E.O. 1975. *Sociobiology: The New Synthesis*. Harvard Univ. Press.