

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/311735299>

Factors influencing Australian teachers' intent to leave the teaching profession

Conference Paper · December 2016

CITATIONS

0

READS

184

2 authors:



[Bo Cui](#)

University of Adelaide

2 PUBLICATIONS 0 CITATIONS

SEE PROFILE



[Alice Richardson](#)

Australian National University

117 PUBLICATIONS 518 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Learning and teaching the language of statistics [View project](#)



Conversion of Field Epidemiology Case Studies for the Master of Applied Epidemiology Program [View project](#)

Factors influencing Australian teachers' intent to leave the teaching profession

Bo Cui^a Alice Richardson^b

^aDepartment of Education and Training,
Queensland Government, 30 Mary Street, Brisbane 4001, Australia

^bNational Centre for Epidemiology & Population Health,
Australian National University, 62 Mills Rd, Acton 2601, Australia

bo.cui@dete.qld.gov.au.

Abstract

Teachers play a vital role in shaping the lives of our children. In Australia, the teaching work force is experiencing a teacher shortage especially in particular subject areas of science, technology, engineering and mathematics. Teacher retention rate is decided by teachers' outflow i.e. teachers permanently leaving the profession prior to retirement. This research uses the Staff in Australia's Schools 2010 data set as the data base to formulate a logistic regression model of teacher outflow, which enriches the quantitative research into Australian teaching work force planning. It addresses the teacher outflow issue by identifying what prominent factors would influence teachers' decision of leaving the profession. Factors that significantly affect Australian teachers' decision in terms of their intention to leave teaching profession are: teachers' satisfaction with student behaviour, salary, working relationship, and age. The analysis also has implications for the literature on school community and school effectiveness.

Keywords: logistic regression, teaching workforce, logit model, attrition, outflow

1 Introduction

Previous education research concluded that teaching is one of the primary drivers in improving student outcomes. From all over the world, it is challenging for governments to address the shortage of high quality teachers. Teacher attrition is highly correlated with teacher quality, because a high attrition rate indicates a high probability of skilled teachers leaving the teaching profession prior to their retirement (van Geffen & Poell 2014). It has been noted that current teacher shortages in Australia in mathematics and science potentially undermine student achievement in these key subjects. Also for at least a decade the Australian Government is concerned about the decreasing number of male teachers especially in primary schools (Ruddock, 2004). School staffing problems are primarily due to the excessively large number of qualified teachers who depart the sector permanently prior to their retirement (Ingersoll 2001). The responsibility for maintaining the day-to-day staffing requirements of schools, particularly in a climate of teacher shortages, lies with education authorities whose decision on particular initiatives to tackle the teacher shortage issue is built on evidence based policy formulation. Thus accurate understanding and prediction

of teacher attrition will help to improve government strategies to deal with the teacher shortage problem.

The purpose of this research is to use logistic regression to estimate Australian teachers' intent to leave teaching profession, and describe the factors (or independent variables) that could precisely predict teachers' intention to permanently leaving teaching profession prior to retirement. Similar models have been applied to earlier waves of the SiAS (Pacific Analytics 2000), in predicting cigarette use (Adwere-Boamah 2010), the nursing workforce (Ujvarine 2011), and even to the task of predicting Academy Award winning movies (Pardoe 2005).

2 Literature Review and Data

Informed by the literature, three blocks of independent variables were identified as being potential contributors to teachers' attrition. They are teacher characteristics, school characteristics and organisational conditions (Dupriez, Delvaux, & Lothaire, 2016; Ingersoll, 2001; van Geffen & Poell, 2014). According to Hancock and Scherff (2010), working load, salary and student behaviour are major causes of teacher attrition. It is also worthwhile to note that teachers who have completed the most advanced studies are the most mobile (Dupriez et al., 2016), thus the logistic regression model will comprise the variables in Table 1 as predictors. It is worth noting that instead of using traditional models such as logistic regression, education related data mining could potentially apply to the modelling of teacher attrition, using techniques from learning analytics and psychometric analysis (Pearson and Moomaw 2005, Pistilli and Arnold 2012).

Staff in Australia's Schools (SiAS) 2010 is the second national survey with responses from 14,535 teachers and school leaders, funded by the Australian Government, and conducted by the Australian Council for Educational Research (ACER). The first survey was conducted in 2006-07. SiAS collected data on a wide range of teacher characteristics and workforce issues including: demographic items, professional learning, qualification, future career intention, and career path. One of the major

Copyright © 2016, Australian Computer Society, Inc. This paper appeared at the Fourteenth Australasian Data Mining Conference, Canberra, Australia. Conferences in Research and Practice in Information Technology, Vol. 170. Yanchang Zhao, Md Zahidul Islam, Glenn Stone, Kok-Leong Ong, Dharmendra Sharma and Graham Williams (Eds.). Reproduction for academic, not-for profit purposes permitted provided this text is included.

purposes of this national survey is to provide relevant data to inform teacher staffing issues and teacher workforce planning (McKenzie et al. 2011). Data on opinions and perceptions from SiAS are self-reported, so are subjective.

In this research 'Planning to leave teaching permanently prior to retirement' will be the response variable, recoded into a binary variable with 1 indicating the teacher will intend to leave versus 0 indicating the teacher will intend to stay. In the SiAS sample 24.7% teachers intend to leave. Predictor variables and their distribution are shown in Table 1.

Teacher Characteristics	
Age (years)	16.5% under 30, 51.6% 30-50, 31.8% 50+
ATSI origin	0.8% ATSI, 99.2% non-ATSI
Gender	69.1% female, 30.9% male
Highest qualification completed in Education	59.2% Undergraduate or vocational education/TAFE, 39.2% PG, 1.6% others
School Characteristics	
ATSI Focus School	13.2% ATSI, 86.8% non-ATSI
Sector	16.1% Independent, 58.2% Government, 25.6% Catholic
Sector of first school	7.9% Independent, 74.9% Government, 17.2% Catholic
Years in first school	33.9% less than or equal to 1 year, 40.2% between 1 and 5 years, 25.9% 5 years and more
Organizational conditions	
Satisfaction with salary	8.9% Very Dissatisfied (VD), 28.7% Dissatisfied (D), 54.1% Satisfied (S), 8.4% Very Satisfied (VS)
Satisfaction with working relationships with colleagues	0.9% VD, 4.3% D, 51.6% S, 43.3% VS
Satisfaction with student behaviour	9.5% VD, 23.5% D, 52.5% S, 14.5% VS
Hours spent per week in face-to-face teaching	60.8% less than 20 hours, 39.2% 20 hours and more
Current employment as a teacher full or part-time	20.7% PT, 79.3% FT

Table 1. Descriptive Statistics for Predictor Variables

3 Method

A simple diagnostic check for multicollinearity was carried out using the correlation matrix. Due to the high correlation between Age and Years of experience ($r = 0.82$), Years of experience was omitted from consideration.

Pallant (2005) emphasizes paying close attention to the outliers. Confidence interval displacement (CBar) is a useful indicator to locate abnormal observations which are potential outliers and have an influential effect on the overall parameter estimates. In order to detect potential outliers, we adopted the suggestion from Peng & So (2002), which is to plot confidence interval displacement (CBar) against observations would reveal observations that exercise a large influence over parameter estimates. There are 173 absolute values of CBar greater than 1 in the SiAS data set, so the 173 observations corresponding to the outstanding CBar values were excluded before performing the final logistic model analysis.

Outliers were identified by checking if the confidence interval displacement exceeds 1 in absolute value, or if Pearson residuals or deviance residuals were greater than ± 2 in magnitude (Zelterman, 2010). The magnitude of the regression coefficients change when individual observations are excluded while model is refitted was also used to identify influential observations (Zelterman, 2010).

SAS® software version 9.1 (SAS Institute 2011) was used to perform data analysis through logistic regression analysis. A logistic regression model was used to predict the chance of the binary outcome based on individual characteristics by obtaining the odds ratio (Sperandei, 2014). The stepwise method of variable selection was also used (Tabachnick, 1996, p.150).

4 Result

Under the stepwise selection procedure, odds ratio estimates and 95% confidence intervals for the variables which entered and stayed in the regression model are listed in Table 2.

Effect	Point Estimate	95% Wald Confidence limits	
Teacher characteristics			
Age (RC = 50+ years)			
less than 30 years	2.711*	2.518	2.918
30-50 years	1.222*	1.167	1.279
Indigenous status (RC = non-ATSI)			
ATSI	0.269 *	0.192	0.377
Gender (RC = male)			
Female	0.644*	0.615	0.675
Qualification (RC = Bachelors)			
Post-graduate	1.392*	1.348	1.438
School characteristics			
ATSI Focus school	1.304*	1.236	1.376
Sector (RC = independent)			

Government	0.743*	0.720	0.766
Catholic	1.245*	1.203	1.289
First school sector (RC = independent)			
Government	0.937*	0.882	0.995
Catholic	1.047	0.979	1.120
Years in first school	0.979*	0.974	0.983
(continuous variable)			
Organisational characteristics			
Salary (RC = very dissatisfied)			
very satisfied	0.398*	0.366	0.433
satisfied	0.563*	0.533	0.594
dissatisfied	0.786*	0.743	0.830
Colleagues (RC = very dissatisfied)			
very satisfied	0.297*	0.248	0.356
satisfied	0.398*	0.333	0.476
dissatisfied	0.760*	0.628	0.919
Student behaviour (RC = very dissatisfied)			
very satisfied	0.434*	0.406	0.464
satisfied	0.503*	0.478	0.530
dissatisfied	0.858*	0.812	0.905
Hours worked	0.992*	0.990	0.994
(continuous variable)			
Employment (RC = Full time)			
Part time	0.754	0.724	0.786
Interactions			
Age*Sector(RC = 50+years & Independent)			
<30 & Government	2.157*	2.059	2.258
<30 & Catholic	2.611*	2.477	2.751
30-50 & Government	0.858*	0.831	0.885
30-50 & Catholic	1.400*	1.347	1.449
Age*Sex (RC = 50+ years & Male)			
<30 & Female	2.400*	2.215	2.602
30-50 & Female	1.071*	1.017	1.128

Table 2. Odds Ratio Estimates (* denotes $p < 0.05$, RC refers to reference category)

For the overall model fitting, the Receiver Operating Characteristic (ROC) Curve (Figure 1), plots the sensitivity (the proportion of true positives) versus 1-specificity (the proportion of true negatives). It indicates the ability of the model to discriminate (Hosmer & Lemeshow 2000), and was chosen as the global logistic regression performance indicator. The area under ROC curve was 0.6829, which means the model correctly classified 68.29% of the teachers' intent to leave. Thus the logistic model can be regarded as an acceptable instrument to predict Australian teachers' Intent to leave teaching profession prediction.

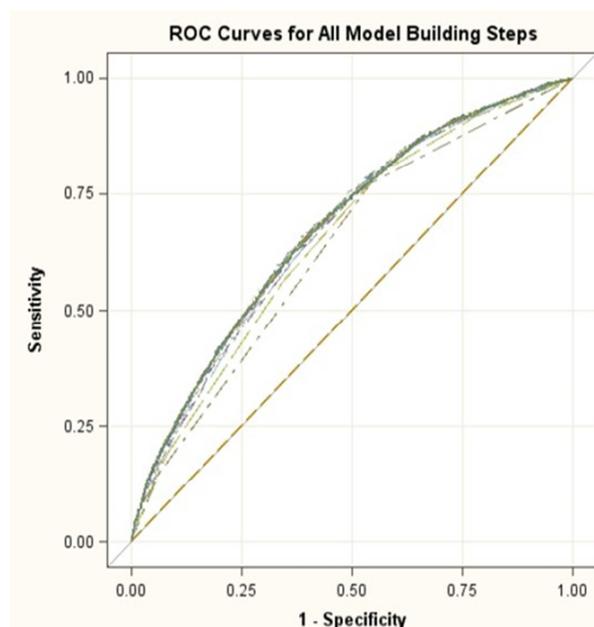


Figure 1. Receiver Operating Characteristic (ROC) curves for the logistic model of teachers' intent to leave.

Firstly, in terms of teacher characteristics, female teachers are 36% less likely to leave compared to male teachers, which is in line with the current serious male teacher shortage issue in Australian primary schools. Younger teachers (less than 30 years old) are nearly 3 times more likely to leave the teaching profession compared to more than 50+ years old teachers. Middle age teachers (30-50 years old) are about 20% more likely to leave compared to more than 50+ years old teachers. An Indigenous teacher has only about a quarter of the probability of leaving compared to non-Indigenous teachers. Teachers with postgraduate qualifications will be around 39.2% more likely to leave compared to those with bachelor degrees.

Secondly, in terms of school characteristics, a teacher from an Aboriginal and Torres Strait Islander (ATSI) focus school will be 30% more likely to leave teaching profession than a teacher from non-ATSI focus school. If the teacher's first school is in government sector, the teacher has slightly lower (around 7% less) chance to leave compared to the teacher's first school is in independent sector. If the teacher's first school is in the Catholic sector, the teacher has slightly higher, though not statistically significant, chance (4% more) to leave compared to if the teacher's first school is in independent sector.

Finally, in terms of organisational characteristics, full time teachers are about 25% less likely to leave the teaching profession than part time teachers. If a teacher is very satisfied with the remuneration, it is around 40% less likely the teacher will leave compared to the teacher who is very unsatisfied with the remuneration. If a teacher is very satisfied with the working relationships, about 70% less likely the teacher will leave compared to the teacher who is very unsatisfied with the working relationships. If a teacher is very satisfied with the students' behaviour, will be nearly 60% less likely to leave compared to the teacher who is very unsatisfied with his or her students' behaviour.

Hilbe (2001) stated ‘interactions play an important role in modelling’, so we used a likelihood ratio test to identify two significant interactions in the logistic regression model: age and gender, and age and sector.

In the age and sector interaction, holding other variables at the baseline, when teachers are less than 30 years old and working in government school, has about twice the chance of leaving the teaching profession over and above the effects of age and sector alone, compared to teachers who are more than 50 years old and working in independent schools. If teachers are between 30 to 50 years old and working in government schools, they are 15% less likely to leave the teaching profession below the effects of age and sector alone, compared to teachers who are more than 50 years old and working in independent schools. If teachers are between 30 to 50 years old and working in Catholic schools, they are 40% more likely to leave the teaching profession compared to teachers who are more than 50 years old and working in independent schools. Teachers who are working in Catholic schools and less than 30 years old, are 1.5 times more likely to leave the profession than independent schools’ close to retiring age teachers.

The age-gender interaction indicates that female teachers who are less than 30 years old are 2.4 times more likely to leave the profession over and above the effects of age and gender alone, compared to more than 50+ years old male teachers. For 30 to 50 years old female teachers, they are 1.07 times more likely to leave over and above the effects of age and gender alone, compared to 50+ years old male teachers.

5 Discussion

According to the interaction of the predictors (Table 2), age-gender and age-sector interactions have a noticeable modification effect in regards to teachers’ intention to leave.

In the big data era, it is not unusual that datasets contain thousands of observations, like the SiAS study, and it may be not appropriate to use traditional modelling techniques due to the computational feasibility. In that case, we may need to consider more computationally intensive approaches such as random forests (Breiman, 2001). It should also be noted that research interest often lies in the estimation of population level relationship between independent and dependent variables in observational study. We based our analysis on unweighted survey data, so it is difficult to obtain population estimates without further information on the representativeness of the sample (Chen, 2015).

There could be a need to further explore confounding factors (with effects on both response and independent variables) which would influence teachers’ intention to leave teaching profession prior to retirement, and include them in the model. Possible confounders could be government policy, such as strategies to reduce the current teacher shortage problem in regional areas of each state/territory; and strategies to reduce teacher shortage in particular subject areas, such as mathematics. Also a potential confounder could be the social environment, such as how respected the teaching profession is in the view of the general public.

6 Conclusion

We observe that teachers’ intention to leave can be successfully predicted by the variables: age, Indigenous status, gender, qualification, whether in a ATSI focused school, school sector, first school sector, how long in first school, employment status, satisfaction with salary/student behaviour/colleagues, and workload. The multiple logistic regression model correctly classified around 70% of the cases, which is an effective approach to predict teachers’ intention to leave teaching profession prior to retirement. The key findings are: that the teachers more likely to leave are younger, non-Indigenous, holders of a post-graduate qualification, male and part-time. In terms of perceptions of the workplace, teachers who are very unsatisfied with the salary, working relationships and student behaviour are also more likely to leave.

These findings are informative and beneficial for policy makers to formulate relevant evidence based teacher retention strategy and policy to address teaching staffing issues.

7 Reference

- Adwere-Boamah, J. 2010. Multiple logistic regression analysis of cigarette use among high school students. *Journal of Case Studies in Education* **1**, 1 – 7.
- Breiman, L. (2001). Random forests. *Machine Learning* **45**: 5 – 32.
- Chen, B., Zhou, X.H., & Chan, G. (2015). Pseudoempirical-likelihood-based method using calibration for longitudinal data with dropout. *Journal of the Royal Statistical Society. Series C (Applied Statistics)*, **64**: 157-174.
- Dupriez, V., Delvaux, B., & Lothaire, S. (2016). Teacher shortage and attrition: Why do they leave? *British Educational Research Journal*, **42**: 21-39.
- Hancock, C. B., & Scherff, L. (2010). Who will stay and who will leave? Predicting secondary English teacher attrition risk. *Journal of Teacher Education*, **61**: 328-338.
- Hastie, T. and Tibshirani, R. (1990) *Generalized Additive Models*. London: Chapman and Hall.
- Hilbe, J.M. (2009). *Logistic Regression Models*. London: Chapman & Hall.
- Hosmer D.W & Lemeshow, S. (2000). *Applied logistic regression* (2ed). New York: Wiley.
- Ingersoll, R. M. (2001). Teacher turnover and teacher shortages: an organizational analysis. *American Educational Research Journal*, **38**: 499-534.
- McKenzie, P., Rowley, G., Weldon, P. & Murphy, M. (2011). *Staff in Australia’s School 2010: Main Report on The Survey*. http://research.acer.edu.au/cgi/viewcontent.cgi?article=1013&context=tll_misc (Accessed 17 June 2016).
- Pacific Analytics Inc. (2000), *Teacher Supply and Demand in Queensland 1981-2009 Main Report*. Education Queensland, Government of Queensland, Brisbane, Australia.
- Pallant, J.F. (2005) *SPSS survival manual: a step by step guide to data analysis using SPSS for Windows*. Sydney, NSW: Allen & Unwin.

- Pardoe, I. (2005). Just how predictable are the Oscars? *Chance* 120.7% PT , 79.3% FT 8: 32 – 39.
- Pearson, L. C. and W. Moomaw (2005). "The relationship between teacher autonomy and stress, work satisfaction, empowerment, and professionalism. *Educational Research Quarterly* 29: 37.
- Peng , C.J. & So, T.H. (2002) Logistic regression analysis and reporting: a primer. *Understanding Statistics* 1: 31-70.
- Pistilli, M. and K. Arnold (2012). Course signals at Purdue: Using learning analytics to increase student success. 2nd International Conference on Learning Analytics and Knowledge, Vancouver, Canada.
- Ruddock, P. (2004). Government moves to address male teacher decline. Media release 186/2004. Canberra: Attorney General's Department.
- SAS Institute (2011). *SAS Version 9.3*. Cary, NC: SAS Institute.
- Sperandei, S. (2014). Understanding logistic regression analysis. *Biochemia Medica*, 24: 12–18.
- Tabachnick, B.G. & Fidell, L.S. (1996) *Using Multivariate Statistics*. 3rd ed. New York: HarperCollins.
- Ujvarine, A.S. (2011). Intent to stay in nursing: internal and external migration in Hungary. *Journal of Clinical Nursing* 20: 882-891.
- van Geffen, R. E., & Poell, R. F. (2014). Responding to teacher shortages: relationships among mobility experiences, attitudes, and intentions of Dutch teachers. *Asia-Pacific Journal of Teacher Education*, 42: 275-290.
- Zelterman, Daniel (2010). *Applied Linear Models with SAS*. Cambridge: Cambridge University Press.

Acknowledgements

The authors are grateful for support from the Australian Commonwealth Department of Education, Employment and Workplace Relations (DEEWR, currently as Department of Education) Teacher Quality and Workforce Data Branch; and staff members Paul Hunt, Margaret Banks, Catherine Quinn and Jan Febey for permission to access to the SiAS data set, and relevant government educational policy guidance.