Factors influencing Australian teachers' intent to leave the teaching profession

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Factors influencing Australian teachers’ intent to leave the teaching profession

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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’ intention 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

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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

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>16.5% under 30, 51.6% 30-50, 31.8% 50+</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATSI origin</td>
<td>0.8% ATSI, 99.2% non-ATSI</td>
</tr>
<tr>
<td>Gender</td>
<td>69.1% female, 30.9% male</td>
</tr>
<tr>
<td>Highest qualification completed in Education</td>
<td>59.2% Undergraduate or vocational education/TAFE, 39.2% PG, 1.6% others</td>
</tr>
</tbody>
</table>

### School Characteristics

<table>
<thead>
<tr>
<th>ATSI Focus School</th>
<th>13.2% ATSI, 86.8% non-ATSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sector</td>
<td>16.1% Independent, 58.2% Government, 25.6% Catholic</td>
</tr>
<tr>
<td>Sector of first school</td>
<td>7.9% Independent, 74.9% Government, 17.2% Catholic</td>
</tr>
<tr>
<td>Years in first school</td>
<td>33.9% less than or equal to 1 year, 40.2% between 1 and 5 years, 25.9% 5 years and more</td>
</tr>
</tbody>
</table>

### Organizational conditions

<table>
<thead>
<tr>
<th>Satisfaction with salary</th>
<th>8.9% Very Dissatisfied (VD), 28.7% Dissatisfied (D), 54.1% Satisfied (S), 8.4% Very Satisfied (VS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction with working relationships with colleagues</td>
<td>0.9% VD, 4.3% D, 51.6% S, 43.3% VS</td>
</tr>
<tr>
<td>Satisfaction with student behaviour</td>
<td>9.5% VD, 23.5% D, 52.5% S, 14.5% VS</td>
</tr>
<tr>
<td>Hours spent per week in face-to-face teaching</td>
<td>60.8% less than 20 hours, 39.2% 20 hours and more</td>
</tr>
<tr>
<td>Current employment as a teacher full or part-time</td>
<td>20.7% PT , 79.3% FT</td>
</tr>
</tbody>
</table>

Table 1. Descriptive Statistics for Predictor Variables

### 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 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 (Sperandeo, 2014). The stepwise method of variable selection was also used (Tabachnick, 1996, p.150).

### 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.

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

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 time 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 maybe 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


**Acknowledgements**

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