Evaluating ELL Reform in a Teacher Education Program

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- The education department is working towards increasing the knowledge of their students in terms of English Language Learners, or ELLs (People with English as a second language)

Introduction to Data

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- **Academic years**: 2008-09, 2009-10, 2010-11, 2011-12
- **Responses**: No Knowledge, Low Knowledge, Adequate Knowledge, High Knowledge and Expert Knowledge
- **10 Questions**: each is a statement and the response is the level of knowledge the graduating student feels they have on the topic in the given statement

Logistic Regression Model

Binary Response Y:

- $Y = 1$ if success, $Y = 0$ if failure
- $P(Y = 1) = \pi$

Logistic CDF:

$$P(X \leq x) = \frac{e^{(x-\mu)/\tau}}{1 + e^{(x-\mu)/\tau}}, \quad -\infty < x < \infty$$

Logit (log-odds link) and Logistic Regression

$$\pi_i = \frac{e^{\alpha+\beta x_i}}{1 + e^{\alpha+\beta x_i}} \quad \log\left(\frac{\pi_i}{1-\pi_i}\right) = \alpha + \beta x_i$$

The odds of success increase by e^{β} for every 1 unit increase in x.

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Solution?

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- Most common Ordinal Logistic Regression is proportional odds.

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- **Assumption**: A variable's effect (Academic Year, Cohort) on the odds of response (Score) below the j-th category is the same for all value of j.
- Necessary to combine Cohorts and Scores in order to meet assumptions.
- The model in R not only produces odds, but it can also produce predicted probabilities for the response, given specific values of the cohort and academic year. Because it is easier to make interpretations from probabilities, that is the main outcome that will be presented.

Proportional Odds

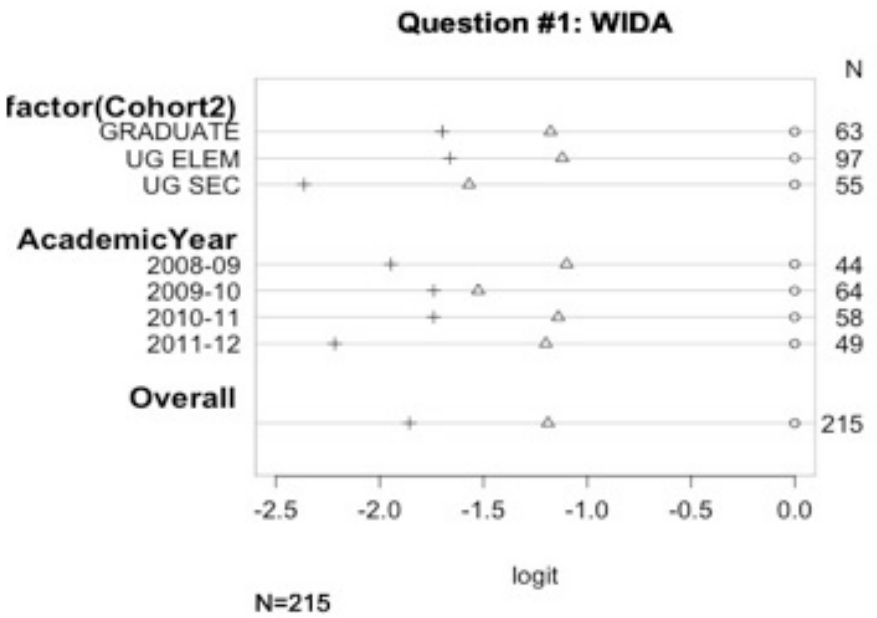
How does the assumption of proportional odds work?

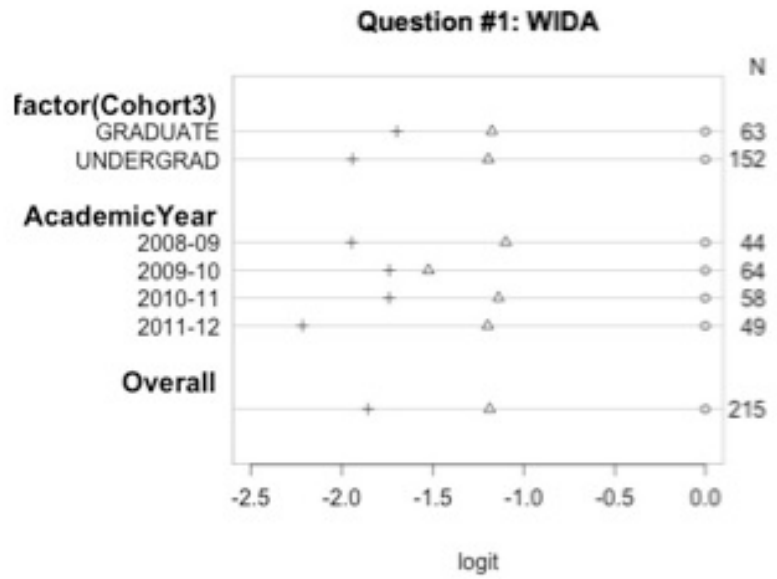
$$\begin{aligned} L_j(\mathbf{x}_1) - L_j(\mathbf{x}_2) &= \log\left(\frac{P(y \leq j|\mathbf{x}_1)}{P(y > j|\mathbf{x}_1)}\right) - \log\left(\frac{P(y \leq j|\mathbf{x}_2)}{P(y > j|\mathbf{x}_2)}\right) \\ &= \alpha + \boldsymbol{\beta}'\mathbf{x}_1 - \alpha - \boldsymbol{\beta}'\mathbf{x}_2 \\ &= \boldsymbol{\beta}'(\mathbf{x}_1 - \mathbf{x}_2), \end{aligned}$$

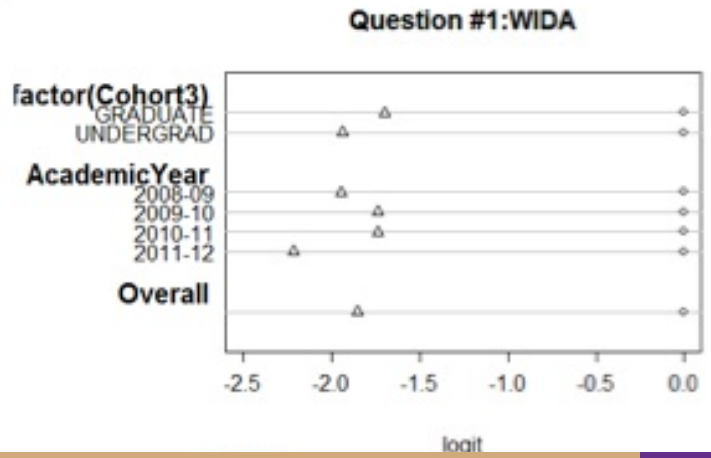
where α is the intercept and $\boldsymbol{\beta}'$ are the coefficients for the independent variables.

As I move from Cohort to Cohort, I would expect the odds to be about the same, so if they line up I can make the assumption which allows me to use the ordinal logistic regression.

Proportional Odds







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- I combined all the graduate programs together into one Cohort called “Graduate", and all the undergraduate programs together into one Cohort called “Undergraduate"
- I combined the “No Knowledge" and “Low Knowledge" to make one group, and I combined the “High Knowledge" and “Expert Knowledge" into another group

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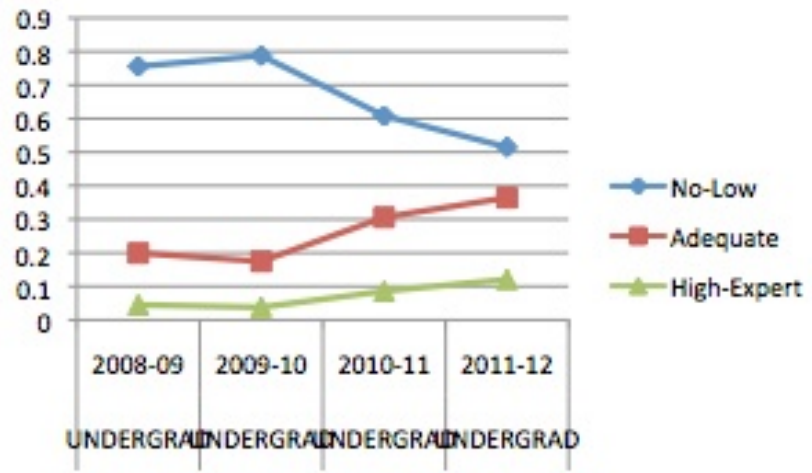
- I combined all the graduate programs together into one Cohort called “Graduate", and all the undergraduate programs together into one Cohort called “Undergraduate"
- I combined the “No Knowledge" and “Low Knowledge" to make one group, and I combined the “High Knowledge" and “Expert Knowledge" into another group
- In the end, my data had the Cohorts “Graduate" and “Undergraduate" and were being rated on a scale of 1–3, 1 being “No to Low Knowledge", 2 being “Adequate Knowledge", and 3 being “High to Expert Knowledge"

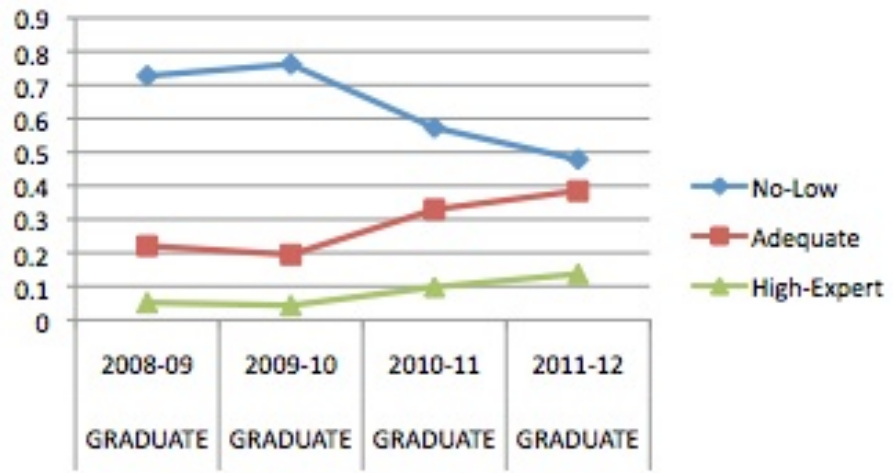
Question #1

- WIDA Standards that define appropriate and sufficient objectives for ELLs
  - WIDA (World-Class Instructional Design Assessment) has teaching standard that are used to better teach ELLs – they have a “Can Do" vision which focuses on what each individual student *can* do opposed to what they should try to improve

Question #1: Results

Estimated Predicted Probability





	No to Low Knowledge		**Adequate Knowledge**		**High to Expert Knowledge**	
Cohort	Academic Year		Academic Year		Academic Year	
Undergrad	2008-09	0.76	2008-09	0.20	2008-09	0.04
	2011-12	0.52	2011-12	0.36	2011-12	0.12
Graduate	2008-09	0.73	2008-09	0.22	2008-09	0.05
	2011-12	0.48	2011-12	0.38	2011-12	0.12

Other Questions: Results

Almost all questions showed similar improvement from 2008-09 to 2011-12

- **Question #2**: The mechanism and process of how ELLs acquire and learn English as a second language for academic purposes
- **Question #4**: The primary schooling practices in the country of the origin of the ELLs enrolled in my classroom
- **Question #6**: The pedagogy to teach language forms, mechanics, and uses
- **Question #7**: Practices and strategies for reinforcing and refining ESL instruction objectives or standards-based content classroom
- **Question #8**: Local community organizations that support ELL families in my school
- **Question #9**: Recent research and theory concerning instruction of English as a second language
- **Question #10**: Vermont policy and laws concerning instruction of linguistically and culturally diverse students

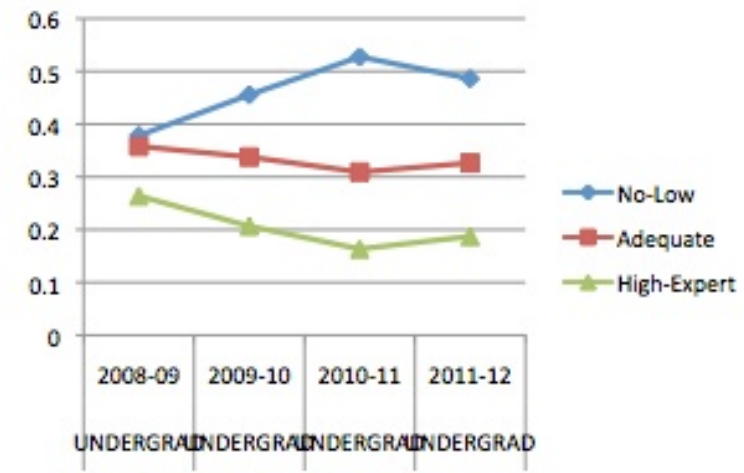
Other Questions: Results

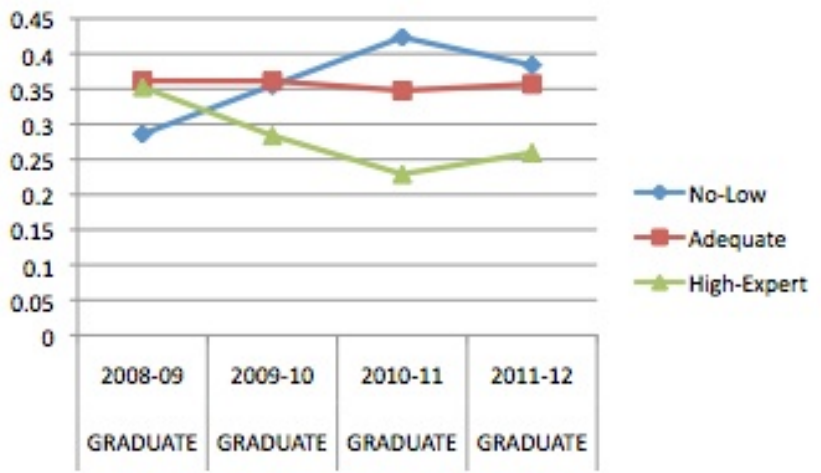
The exceptions:

- **Question #3**: The language backgrounds, experiences, and proficiencies of ELLs in my classroom
- **Question #5**: The connection between language, culture, and identity

Question #3: Results

Estimated Predicted Probability

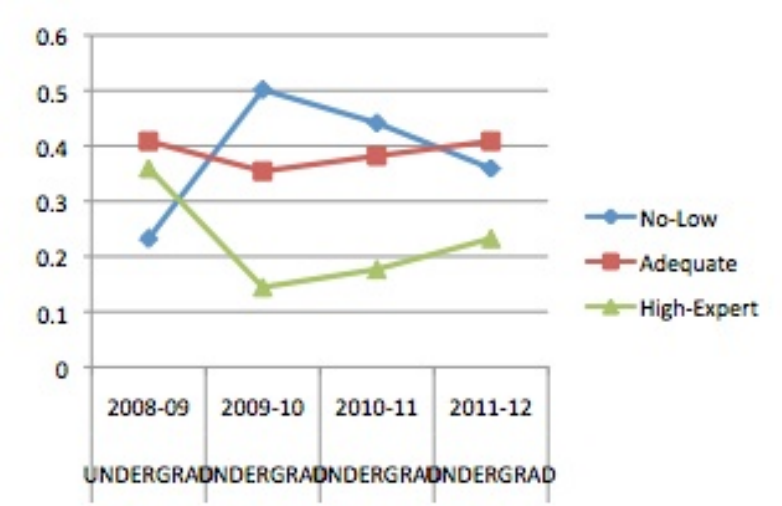


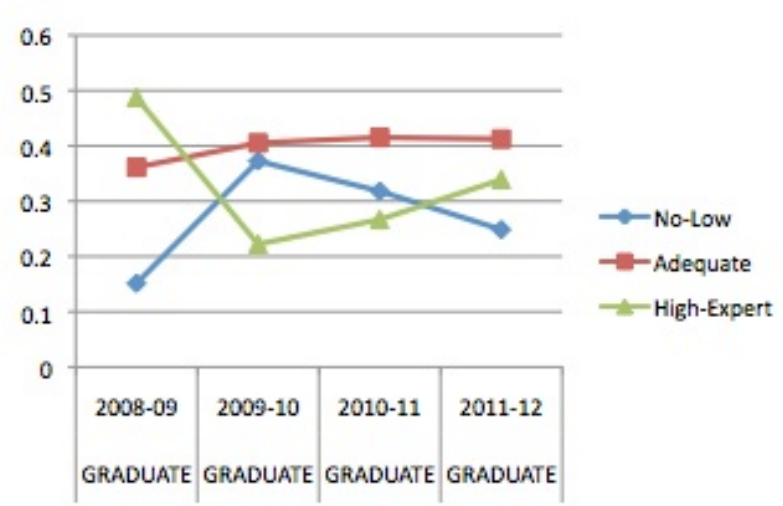


	No to Low Knowledge		Adequate Knowledge		High to Expert Knowledge	
Cohort	Academic Year		Academic Year		Academic Year	
Undergrad	2008-09	0.38	2008-09	0.36	2008-09	0.26
	2011-12	0.49	2011-12	0.33	2011-12	0.19
Graduate	2008-09	0.29	2008-09	0.36	2008-09	0.35
	2011-12	0.38	2011-12	0.36	2011-12	0.26

Question #5: Results

Estimated Predicted Probability





	No to Low Knowledge		**Adequate Knowledge**		**High to Expert Knowledge**	
Cohort	Academic Year		Academic Year		Academic Year	
Undergrad	2008-09	0.23	2008-09	0.41	2008-09	0.36
	2011-12	0.36	2011-12	0.41	2011-12	0.23
Graduate	2008-09	0.15	2008-09	0.36	2008-09	0.49
	2011-12	0.25	2011-12	0.41	2011-12	0.34

Summary

- Almost all of the questions showed improvement from 2008-09 to 2011-12

- The exceptions were Question #3 (about language backgrounds in the classroom) and Queston #5 (about the connection between language, culture, and identity in the classroom)

Future Work

- In the future, I would like to use the proportional odds results I have already obtained to look at residuals for diagnostic purposes.
- Analyze these data using multinomial logistic regression – no proportional odds assumption to worry about. Downside is that it does not use the natural ordering like ordinal logistic regression does.
- Investigate what changes in a particular curriculum actually work.