Development Grants

PROPOSAL

Translating Cultures Research Innovation Grants 6 March 2014

Organisation where the Grant would be held

<table>
<thead>
<tr>
<th>Organisation</th>
<th>University of Leeds</th>
<th>Research Organisation Reference:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Division or Department</td>
<td>Sch of Education</td>
<td></td>
</tr>
</tbody>
</table>

Project Title [up to 150 chars]

Translating science for young people

Start Date and Duration

a. Proposed start date

| 01 November 2014 |

b. Duration of the grant (months)

| 20 |

Applicants

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>Organisation</th>
<th>Division or Department</th>
<th>How many hours a week will the investigator work on the project?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Investigator</td>
<td>Professor</td>
<td>University of Leeds</td>
<td>Sch of Education</td>
<td>7.5</td>
</tr>
<tr>
<td>Co-Investigator</td>
<td>Professor</td>
<td>Lancaster University</td>
<td>Linguistics and English Language</td>
<td>1.67</td>
</tr>
<tr>
<td>Co-Investigator</td>
<td>Dr</td>
<td>University of Leeds</td>
<td>Sch of Education</td>
<td>3.75</td>
</tr>
</tbody>
</table>
Objectives

List the main objectives of the proposed research in order of priority [up to 4000 chars].

The primary objective of this project is to investigate the translation and transformation of current scientific knowledge about climate change in communications for and with young people aged 11-16 (Key Stages 3 and 4 in English schools). Translation here is understood as the interpretation and transformation of ideas between and across related genres in the same language. In this case, the genres are expert writing in science, the genres used by educators and other writers communicating with young people about science, and young people’s talk about their understandings of science and attitudes towards it. We are also concerned with issues of what is not translated, or is apparently mistranslated, and how young people’s talk about their understandings and attitudes towards science may reflect this translation, non-translation and mistranslation. We will compile three corpora of texts on climate change representative of (a) texts produced by scientists and related experts for peer audiences (approximately 500,000 words); (2) texts accessed by young people in both educational and non-educational settings (approximately 300,000 words); and (c) spoken language produced by young people in interviews (approximately 200,000 words). We will analyse each of these three corpora to identify the use of a group of linguistic features of texts which are known to be central in conveying information, evaluation and stance. We will compare the results of the analyses of the three corpora in order to identify commonalities and differences in the information, evaluations and stance conveyed towards issues in climate change.

The secondary aim of the project is to develop and extend understandings of how linguistic metaphorical and metonymical framing devices and related linguistic mechanisms, are used in a real-life context to explain, simplify and encode information, agency and evaluative stance. We will analyse how the use of metaphor and related devices varies between the genres represented by our three corpora. We will relate our findings to other studies of the use of metaphor and related devices across genres.

Summary

Describe the proposed research in simple terms in a way that could be publicised to a general audience [up to 4000 chars]. Note that this summary may be published on the AHRC’s website in the event that a grant is awarded.

The project is concerned with how state-of-the-art scientific knowledge is translated, or, possibly, not translated or mistranslated, in texts accessed by young people aged 11-16. The research focusses on texts produced around climate change, a socioscientific issue of central importance, and one which has implications for lifestyle and patterns of consumption. Understanding such socioscientific issues is central to young people’s future lives as active citizens, but 11- to 16-year-olds are unlikely to be able to read the texts in which scientists communicate their research findings, such as articles in specialised journals. Rather, young people find out about scientific issues from a variety of educational and popular texts, as well as from online sources and social media. The translation of information across genres may result in distortion; for instance, there is some evidence that public understanding of the human role in climate change is significantly at odds with the current scientific consensus.

To investigate translation in this context, we will conduct linguistic analyses of three large language datasets, composed of collections of texts about climate change, representing the following:

1. The language of science used by experts, represented by research articles and policy texts such as produced by the Intergovernmental Panel on Climate Change;
2. The language of texts that young people access, represented by popular and educational materials, including curriculum materials, educational websites such as ‘BBC Bite-size’, popular science texts, internet forums, Twitter feeds and other texts used by young people. The selection will informed by interviews with young people and with teachers.
3. The language used by young people interviewed about climate change.

We will analyse a group of linguistic devices including metaphors, metonyms, words combinations (collocations) and the use of technical terms. These have been shown to be important in communicating scientific information and stance towards ideas. They can also convey emotional attitudes towards what they refer to, and degrees of probability and certainty. We will compare the analyses of the three datasets and identify commonalities and divergences in what is communicated and
how. By analysing the interviews with young people, we will also consider how scientific information, attitudes and probabilities are understood and reframed by the young people themselves. We will use the techniques of corpus linguistics, that is, the use of specialised software for studying large quantities of text automatically, supported by some qualitative manual language analysis. Our procedure is as follows:

We will use corpus linguistic software to perform preliminary analyses on the datasets. These techniques will enable us to identify significant quantitative features of the datasets, and differences in language use between them. For instance, we will be able to identify which words are used most frequently in each, and to compare these, and which combinations of words and semantic fields occur frequently in each dataset, and frequently relative to each other. We will also perform detailed manual text analysis of samples of each dataset to identify key linguistic characteristics. This information will be used as a starting point for more detailed language analysis. Corpus software will then be used to study language patterns in more detail, to determine key patterns of meaning and use in each corpus, and differences between them. This use of detailed linguistic methods in tackling young people’s understanding of socioscientific issues is innovative.

Our findings will be important for professionals concerned with communicating science to the general public, especially young people, including scientists and science journalists. They will also be important for science education professionals, and for organisations concerned with public awareness of climate science.

Outputs

The main outputs of the research

| Journal article (refereed) |
| Conference paper |
| Datasets |
| Website |
| Other |

Ethical Information

Are there ethical implications arising from the proposed research? Yes

Provide details of what they are and how they would be addressed [up to 1000 characters]

We will be interviewing school students aged 11-16 and school teachers. The interviewers have or will obtain enhanced clearance from the Disclosure and Barring Service. Prior to conducting the interviews, we will ask for participants' consent for each interview to be used as part of our data, and, in the case of the students, we will also request consent from their parents or carers, and their schools. We will also ask for consent for the data to be included in a database that may be made available to other researchers. Participants and their parents/ carers or schools will be given the opportunity to withdraw consent after the interviews have been conducted. All interviewees and people who may be mentioned in the interview data, and any other identifying names will be anonymised. The full project will be subject to ethical review by ethics committee of the Faculty of Education, Social Science and Law at the University of Leeds.

Does the institution have a policy on good conduct in research? Yes

Details of where the policy can be accessed

The policy can be accessed at the University of Leeds website: http://ris.leeds.ac.uk/goodpractice

Academic Beneficiaries

Describe who will benefit from the research [up to 4000 chars].

Our work is cross disciplinary in its application of metaphor and metonymy theory, linguistic analysis and corpus linguistic techniques to issues of interest to researchers in the communication and education of science. The work will be relevant to...
the following groups of academic researchers nationally and internationally:

Within the field of Language Analysis and Description/ Applied Linguistics:
1.) Our work significantly extends two current directions in Corpus Linguistics. Firstly, this project will make an important contribution to the growing body of corpus linguistic analysis of specialised genres and registers. There are a number of corpus studies of specific text types: ours is especially rigorous in its careful consideration of the audience, as well as the subject matter, of the content of each corpus, and in the size of the proposed corpora, which are relatively large for such a specialised and detailed study.
Secondly, it develops the synergy between Corpus Linguistics and other fields. In the early years of the discipline, corpus linguists were largely concerned with the description of language itself; more recently, corpus techniques have been used to look beyond language to societal concerns, including climate change. Our research extends this, but is innovative in its focus on the language of young people, its educational implications, and in its consideration of a range of popular texts. Our work will therefore benefit academics in the field by contributing to the pool of methodologies and applications of corpus techniques.
2.) Our work will make an important contribution to studies of metaphor and figurative language and will push forward the research agenda in that area. The field has increasingly used corpus tools and larger datasets; this work builds on that trend, but is exceptional within figurative language studies in its proposed scale combined with a tight focus and rigour. It is also important in its recognition of the increasing importance of metonymy, and in its detailed exploration of how figurative language is used in expressing informational and attitudinal meaning.
3.) Our work will contribute to knowledge about translation across genres. This is of interest to scholars of genre and register. In particular, genre analysis has been concerned with how academic content is translated in popular texts, and the educational implications of this, for example, for students of English for Specific and Academic Purposes.

Within the fields of Science Communication and Science Education:
1.) Our work is an innovative contribution to the field of science communication, because it brings detailed linguistic analyses to questions that are generally researched using content analysis. Scholars of science communication have long recognised the role of metaphor in scientific thinking and language, but there have been few studies of this scale and detail, and relatively few conducted by specialists in linguistic metaphor.
2.) We will make a contribution to research in science education, again through the use of detailed linguistic techniques. In our consideration of popular and digital texts as well as curriculum materials, we will develop a fuller view of what young people are told about science, and how they reframe this.
Our work offers an innovative example of collaboration between these fields and linguistics, and aims to prompt a new tradition in the research of socioscientific and educational issues that will benefit scholars in both fields.

Impact Summary

Impact Summary (please refer to the help for guidance on what to consider when completing this section) [up to 4000 chars]
The research will benefit individuals, groups and organisations who are concerned with the public dissemination of science, and particularly the engagement of young people with scientific knowledge concerning climate change in the UK. These include:
(1) individual scientists and groups of researchers who are concerned to communicate effectively with the public, especially young people;
(2) science teachers and teacher organisations, and curriculum designers and policy-makers in the area of science education;
(3) charities and organisations devoted to scientific issues and specifically climate science.

We have identified the following organisations as channels through which we can reach potential beneficiaries:
The UK Youth Climate Coalition - an organisation run by young volunteers that aims to ‘inspire, empower, mobilise and unite young people to take positive action on climate change for a cleaner, fairer future’ (http://ukycc.org).
The Royal Society - which aims to 'recognise, promote, and support excellence in science and to encourage the
development and use of science for the benefit of humanity' (http://royalsociety.org); one of the Society's priorities is the engagement of young people with science.

The UK's Association for Science Education - the largest subject education in the UK, which promotes 'excellence in teaching and learning of science in schools and colleges' (http://www.ase.org.uk/home/).

SCORE, the Science Community Representing Education, a group which 'aims to improve science education in UK schools and colleges by supporting the development and implementation of effective education policy' (http://www.score-education.org).

We will also work with education professionals directly through our existing contacts, and through further contacts that we will build. The members of these different groups will benefit from an increased awareness of the language that is used to talk about scientific issues, and particularly climate change, in texts aimed at young people and in talk by young people themselves, and of how this relates to the language used by experts in scientific journals. This greater awareness can inform science teaching and education more generally, including campaigns by charities and organisations that aim to create a greater understanding and engagement in science on the part of young people.

The project will benefit from an Advisory Group, which will include representatives of the users we wish to reach. The group will advise on the research and on the engagement and impact strategy. We will engage with users through a range of events, including workshops for education professionals in the region, and presentations regionally and nationally. We will document news of the project and our findings through a variety of formats including those accessible to the general public and to young people. We aim to produce a greater understanding of the issues involved in translating scientific knowledge, and in communicating its relevance to young people, and as a result, more effective communication across the parties involved and a greater engagement by young people with scientific knowledge and socioscientific issues.
### Summary of Resources Required for Project

#### Financial resources

<table>
<thead>
<tr>
<th>Summary fund heading</th>
<th>Fund heading</th>
<th>Full economic Cost</th>
<th>AHRC contribution</th>
<th>% AHRC contribution</th>
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<tbody>
<tr>
<td>Directly Incurred</td>
<td>Staff</td>
<td>42102.00</td>
<td>33681.60</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Travel &amp; Subsistence</td>
<td>7290.00</td>
<td>5832.00</td>
<td>80</td>
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<tr>
<td></td>
<td>Other Costs</td>
<td>8600.00</td>
<td>6880.00</td>
<td>80</td>
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<td></td>
<td><strong>Sub-total</strong></td>
<td><strong>57992.00</strong></td>
<td><strong>46393.60</strong></td>
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<tr>
<td>Directly Allocated</td>
<td>Investigators</td>
<td>44418.90</td>
<td>35535.12</td>
<td>80</td>
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<td></td>
<td>Estates Costs</td>
<td>15212.00</td>
<td>12169.60</td>
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<td></td>
<td>Other Directly Allocated</td>
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<td>50691.20</td>
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<td>Exceptions</td>
<td>Other Costs</td>
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<td>0.00</td>
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<td></td>
<td><strong>Sub-total</strong></td>
<td><strong>0.00</strong></td>
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<td><strong>180986.90</strong></td>
<td><strong>144789.52</strong></td>
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#### Summary of staff effort requested

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<th>Months</th>
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<tr>
<td>Investigator</td>
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<tr>
<td>Researcher</td>
<td>12</td>
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<td>Technician</td>
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<td>Other</td>
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<td>Visiting Researcher</td>
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<tr>
<td>Student</td>
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<td><strong>Total</strong></td>
<td><strong>19</strong></td>
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### Staff

#### Directly Incurred Posts

<table>
<thead>
<tr>
<th>Role</th>
<th>Name /Post Identifier</th>
<th>Start Date</th>
<th>Period on Project (months)</th>
<th>% of Full Time</th>
<th>Scale</th>
<th>Increment Date</th>
<th>Basic Starting Salary</th>
<th>London Allowance (£)</th>
<th>Super-annuation and NI (£)</th>
<th>Total cost on grant (£)</th>
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</thead>
<tbody>
<tr>
<td>Researcher</td>
<td>Postdoctoral researcher</td>
<td>01/11/2014</td>
<td>20</td>
<td>60</td>
<td>7</td>
<td>01/11/2014</td>
<td>33562</td>
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<td>8139</td>
<td>42102</td>
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**Total**: 42102

#### Applicants

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>Post will outlast project (Y/N)</th>
<th>Contracted working week as a % of full time work</th>
<th>Total number of hours to be charged to the grant over the duration of the grant</th>
<th>Average number of hours per week charged to the grant</th>
<th>Rate of Salary pool/banding</th>
<th>Cost estimate</th>
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<td>Y</td>
<td>100</td>
<td>550</td>
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<td>85395</td>
<td>28465</td>
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<tr>
<td>Co-Investigator</td>
<td>Professor</td>
<td>Y</td>
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<td>1.9</td>
<td>78440</td>
<td>6513</td>
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<tr>
<td>Co-Investigator</td>
<td>Dr</td>
<td>Y</td>
<td>100</td>
<td>275</td>
<td>3.7</td>
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**Total**: 44419
### Travel and Subsistence

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<thead>
<tr>
<th>Destination and purpose</th>
<th>Total £</th>
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</thead>
<tbody>
<tr>
<td>Within UK recruitment travel and expenses: 5 candidates at £75 pp</td>
<td>375</td>
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<tr>
<td>Within UK Travel costs for interviews in local schools (with teachers and pupils): 12 local trips at £25 including subsistence</td>
<td>300</td>
</tr>
<tr>
<td>Within UK 5 x project meetings travel: Co-I (Prof) return rail fares from Lancaster to Leeds at £50 per trip</td>
<td>250</td>
</tr>
<tr>
<td>Within UK 5 x dissemination talks to local teachers: Co-I (Dr) travel to schools at £25/ trip</td>
<td>125</td>
</tr>
<tr>
<td>Within UK Travel to meet with the Theme Fellow in London: PI and Co-I's (Indira Banner) travel from Leeds to London at £100 plus subsistence at £25 x 2</td>
<td>500</td>
</tr>
<tr>
<td>Within UK Workshop for curriculum designers/end of project event in London: Research team's travel (PI, 2 x Co-I and RA) at £100 each plus 1 night accommodation and subsistence at £120 each</td>
<td>880</td>
</tr>
<tr>
<td>Within UK Final dissemination event in Leeds: travel reimbursement for up to 20 core participants/users at £60 pp</td>
<td>1200</td>
</tr>
<tr>
<td>Within UK ASE Conference: PI and Co-I (Dr)’s travel from Leeds to Reading at £100 plus 2 nights accommodation and subsistence at £120 p/n (standard UoL rate) plus registration fee at £300</td>
<td>1280</td>
</tr>
<tr>
<td>Outside UK ESERA Conference: Co-I (Dr) rtn flights Leeds-Helsinki plus airport transfers at £350 plus registration at £300 plus 3 night accommodation and subsistence at £120 p/n</td>
<td>1010</td>
</tr>
<tr>
<td>Outside UK Specialist Metaphor seminar (Dr): Co-I’s return flights Manch-Amst at £130 including airport transfers plus Amsterdam-Leiden train at £50 plus 1 night subs and accomm at £120 plus registration at £100</td>
<td>400</td>
</tr>
<tr>
<td>Outside UK Specialist Metaphor seminar (Dr): PI and RA’s return flights Leeds-Amst at £130 including airport transfers plus Amsterdam-Leiden train at £50 plus 1 night subs and accomm at £120 plus registration at £100</td>
<td>800</td>
</tr>
<tr>
<td>Within UK Corpus Linguistics Conference in Lancaster: RA’s Leeds - Lancaster travel at £50 plus one night accommodation and subsistence at £120</td>
<td>170</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>7290</strong></td>
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### Other Directly Incurred Costs

<table>
<thead>
<tr>
<th>Description</th>
<th>Total £</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 x Advisory Board meetings: catering for 10 people at £7pp x 4</td>
<td>280</td>
</tr>
<tr>
<td>Payment to schools for participating in research: 4 schools at £500 per annum x 18 months towards teaching cover and administration costs for data collection</td>
<td>3000</td>
</tr>
<tr>
<td>Sketchengine software licence for 2 people (PI and RA) x 2 years at £60 per annum</td>
<td>240</td>
</tr>
<tr>
<td>Final dissemination event in Leeds (for teachers, head teachers, pupils, DiE reps, ASE reps, publishers, etc.): room hire and catering for 50 people at £32 pp (based on Hinsley Hall rates)</td>
<td>1600</td>
</tr>
<tr>
<td>Workshop for curriculum designers/end of project event in London: room hire and catering: £500 room hire at the Royal Society plus catering for 40 participants at £12 pp</td>
<td>980</td>
</tr>
<tr>
<td>Corpus Linguistics Conference in Lancaster: registration fees at £100 for PI, Co-I (Dr) and RA</td>
<td>300</td>
</tr>
<tr>
<td>Teacher cover for advisory board meetings; 3 teachers x 4 half days (£200/ full day)</td>
<td>1200</td>
</tr>
<tr>
<td>Teacher cover for final dissemination event; 5 teachers x 1 full day (£200/ day)</td>
<td>1000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8600</strong></td>
</tr>
</tbody>
</table>

### Estates Costs

| Amount (mandatory) | £15,212 |
Proposal Classifications

Research Area:
Research Areas are the subject areas in which the research proposal may fall and you should select at least one of these. Once you have selected the relevant Research Area(s), please ensure that you set one as primary.

To add or remove Research Areas use the relevant link below. To set a primary area, click in the corresponding checkbox and then the Set Primary Area button that will appear.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Topic</th>
<th>Keyword</th>
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</thead>
<tbody>
<tr>
<td>Education</td>
<td>Curriculum areas</td>
<td></td>
</tr>
<tr>
<td>Linguistics</td>
<td>Corpus Linguistics [Primary]</td>
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Qualifier:
Qualifiers are terms that further describe the area of your research and cover aspects such as approach, time period, and geographical focus. Please ensure you complete this section if relevant.

To add or remove Qualifiers use the links below.

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach</td>
<td>Large new datasets</td>
</tr>
<tr>
<td>Geographic Area</td>
<td>England</td>
</tr>
<tr>
<td>Project Engagement by Sector</td>
<td>Other Public Sector</td>
</tr>
<tr>
<td>Project Engagement by Sector</td>
<td>Press and Media</td>
</tr>
<tr>
<td>Project Engagement by Sector</td>
<td>Professional/Statutory Bodies</td>
</tr>
</tbody>
</table>

Free-text Keywords:
Free-text keywords may be used to describe the subject area of the proposal in more detail. It is particularly important that you provide these where the Research Area(s) you have selected are only defined to two levels.

To add or remove those previously added use the links below.

Classification

Is your research multidisciplinary (i.e. involves researchers from two or more different disciplines)?

✓ Yes  No

Is your research interdisciplinary (i.e. applies methods and approaches of several disciplines)?

Yes ✓ No
Case for support: Translating science for young people

1. Fit to the call and contribution to the theme
The proposed research fits the "Translating Cultures Innovation Grants" call strategic question (2) "How can research into languages and cultures [...] extend analysis of the ways in which translation serves as a form of transmission and circulation of ideas, ideologies and forms of knowledge between geographical locations, historical moments and cultural contexts?"

The primary aim of the project is to investigate the translation and transformation of current scientific knowledge in communications for and with young people aged 11-16 (Key Stages 3 and 4 in English schools). Understanding what happens when scientific knowledge and ideas are translated is important because scientific issues are central to young people’s future lives as active citizens (Schreiner et al, 2008), yet texts produced by scientists for their peers are not generally accessible to non-specialists. Translation here is understood as the interpretation and transformation of ideas between and across related genres in the same language, in this case, between experts in science, educators and other writers, and young people. We are also concerned with issues of what is not translated, or is apparently mistranslated, and how young people’s talk about their understandings and attitudes towards science may reflect this translation, non-translation and mistranslation.

The secondary aim of the project is to develop understandings of how linguistic metaphorical and metonymical framing devices, and related linguistic mechanisms, are used and translated in a real-life context to explain, simplify and encode information, agency and evaluative stance.

Language choices and use are at the core of translation, whether inter-lingual, or as in our proposed research, intra-lingual, but most research in the communication of science to the public and in science education for young people uses informant interviews and content analysis as its central methods. This project is innovative in that it brings detailed linguistic expertise and techniques to analysing a large body of relevant texts. We have chosen to focus on a specific scientific topic, climate change, to ensure some parity of subject matter across the corpora studied. The topic chosen is a Socioscientific Issue (Morris, 2014) that has a considerable body of research literature, is dealt with in science and other curriculum areas in schools, has implications for lifestyle and society more widely, and potentially major consequences during the lifetimes of current school students.

The project will extend the range of corpus linguistic research techniques to this important societal issue. The PI and one Co-I (**) have established international reputations in both the quantitative and qualitative analysis of linguistic data, including in science communication (e.g. ***, 2013; ***, 2011). Together and separately they have analysed variations in figurative language use according to genre and register, and the metaphors of expert and popular science writing. The project also seeks to bring forward the second Co-I (***)'s research into the learning of science by secondary school students, and their views of the role of science in their lives. The project builds on both these bodies of research and also represents a new collaborative venture in bridging the two fields.

2. Research questions
We will address the following questions:

Overarching questions:
How is specialist scientific knowledge translated, not translated or apparently mistranslated in texts accessed by young people?
How do young people account for their understanding and attitudes towards scientific knowledge about climate change?

Specific questions:
1. What are the predominant metaphorical and metonymical frames and related linguistic devices used in the language produced by experts for their peers or knowledgeable counterparts in texts dealing with climate change?
   - Which aspects of each topic are highlighted by these frames and devices?
   - What evaluative meanings are presented by these frames and devices?

2. What are the predominant metaphorical and metonymical frames and related linguistic devices used in popular and educational texts aimed for and used by young people dealing with climate change?
   - Which aspects of each topic are highlighted by these frames and devices?
   - What evaluative meanings are presented by these frames and devices?
3. What are the predominant metaphorical and metonymical frames and related linguistic devices produced by young people in talk about climate change?
   Which aspects of each topic are highlighted by these frames and devices?
   What evaluative meanings are presented by these frames and devices?
   How does the language young people use suggest their understanding, attitude and perception of agency with respect to the topic?

4. What commonalities and differences exist in the framing of knowledge and world view between texts produced by and for experts, popular and educational texts, and talk produced by young people?

5. How do the language devices listed above vary in the way they frame knowledge, and stance, agency and evaluation towards science depending on the text creator and intended receiver?

3. Research context

3.1 Science, the public and young people

Scientists recognise the need to communicate with non-scientists, and the way they do this is an object of study in itself. There are two major journals dedicated to this: Science Communication, and Public Understanding of Science; the communication of climate change is of especial interest. Hargreaves et al (2004) and Davies (2004) argue that access to scientific knowledge is important in order for a democracy to function, so that the public can make informed decisions about what is in their interest. In the UK, modern interest can be traced back to the Royal Society’s publication of ‘The Public Understanding of Science’ in 1985 (Hansen, 2009: 106). Since then (ibid), researchers have moved away from a deficit model which stressed the need to provide information, to a concern with public engagement, including the public’s attitudes towards scientific advances, and controversies. The process of sharing scientific information with the public is not straightforward, and divergences between scientists’ beliefs and public opinion have been noted. For instance, in the case of anthropogenic climate change, Farnworth and Richter (2012) claim that while scientists are reaching consensus on all but the details of the human contribution to change, public perceptions are moving in the opposite direction, with increasing scepticism.

Within the academic study of Science Education, there is debate about how to develop in young people an understanding of the broad context and contributions of science, and the ability to interpret media information about science critically. McClune and Jamieson (2012) write that young people need to understand how science can impact outwardly on social questions; they are not just individuals but citizens with the implied duty to make informed and responsible choices. Schreiner et al (2012) relate this specifically to climate change, arguing that young people need to be empowered by scientific knowledge to act for their own future. Morris (2014) reviews the issues in enabling science students to understand the repercussions of science on our own lives, and our responsibilities.

3.2 Linguistic analysis of metaphor, metonymy and related devices across genres

This project will identify and analyse metaphors, metonymy and related linguistic devices in scientific texts. Metaphor is agreed to be central in the development of scientific ideas and their communication (Brown, 2003). For example, the development of scientists’ understanding of the structure of molecules was driven by a succession of metaphorical models and frames that enabled them to visualise and predict molecular structure (ibid). Metaphors also pervade the communication and pedagogy of science: these include protein folding (ibid) the balance of nature (Deignan et al, 2013) and language metaphors for DNA, including script, code, and draft (Semino, 2008).

The linguistic analysis of metaphors and metonymies has also been found to be illuminating in showing the frames that underlie world-views and evaluative stance in both general and scientific text (Charteris-Black, 2004; Deignan, 2005, 2008). Linguistic metaphors and metonymies can enable the researcher to identify the metaphorical frames through which a topic or an entity is constructed. For example, the existence of the linguistic metaphors flood and waves in a text describing immigrants to the UK could indicate a frame in which immigrants are natural phenomenon without human agency, and one which has catastrophic negative consequences (Semino, 2008). A balance metaphor for nature implies harmony and thus a negative stance towards change. Metaphorical frames generally have entailments that are not explicitly stated but can be constructed by the reader or hearer; for example, entailments of floods are that they cause damage and should be guarded against.

Within the linguistics and metaphor literature, there have been a number of studies of how scientific issues such as climate change are presented in non-specialist texts, often but not always
focussing on the quality press. Nerlich and her colleagues have made significant contributions. For instance, Nerlich (2010) analysed media texts around the unauthorized publication of climate scientists’ emails in 2009, showing that the media’s use of religious metaphors tended to frame climate science negatively as “preaching”. She also examined the metaphors in news texts on geoengineering as a climate mitigation strategy (2012), identifying metaphors describing geoengineering as a thermostat, as sunblock, and as a toolkit, among others. The metaphorical frames oversimplify the very complex science involved, and suggest that the remedy is as easy as, for example, repairing a car. Jaspaï et al. (2013) analysed laypeople’s comments on climate change topics on the Daily Mail website, which used discursive strategies to denigrate scientists. They called for further research into the language of laypeople within the “volatile social context in which science is embedded” (ibid 405), a gap which this project aims to partly meet.

Metonymy is the use of an aspect of a topic to represent the whole topic, and is closely related to metaphor. For instance, in literature on climate change, carbon tends to stand for carbon dioxide, and metonymically for issues associated with climate science, in compounds such as carbon crusade (Kolevko et al, 2010). Like metaphors, they can convey partial or evaluatively-laden perspectives.

Other linguistic devices can also reveal important patterns of meaning. For example, collocation is the study of how words occur together. Jaspaï et al (2013) analysed a small corpus of texts written by scientists for their peers about the effects of climate change on glaciers and a popular text based on these peer texts. They found that in the popularisation, more than half of all uses of models collocated with show (editions), in sentences such as “new data and models show that...”. In scientists’ texts, the collocation of model with show did not occur, even though model and the forms modeling, modeling etc were frequently used, and show is a high frequency verb. Closer analysis showed that this was because the texts in the two corpora used subtly different understandings of what a model is and can do, which in turn signified different attitudes to evidence and probability. There are a number of other ways in which probability is signaled in language.

The function, or purpose of these language items can also be significant. Jaspaï et al’s study (2013, discussed above) found that metaphors and metonyms served different functions in the two datasets analysed: in texts written by scientists for their peers, metaphors and metonyms tended to be used as technical terms and to convey research ontology, while in the popular texts they were used to convey a world view, dramatizing and simplifying the message of the peer texts.

4. Research methods
The setting for the research is young people learning about science and related topics in KS3 and KS4, and access to the participants will be through schools. The School of Education at Leeds works with a number of schools through its initial teacher-training arm and has a successful tradition of research partnerships with a number of them. Aspects of the study will inevitably be concerned with what has been studied in school, and therefore, texts used in school, but this is not primarily a study of curriculum and materials. The focus is on language experienced in a broader sense, through popular print and digital media as well as educationally oriented texts.

The two central and complementary analytical tools that this project will use are corpus linguistic analysis and text analysis. Corpus linguistic analysis refers to the automated linguistic analysis, using specialised software, of collections of texts (corpora) that are normally too large to process manually. It is generally acknowledged that for the purposes of identifying frequent patterns of form and meaning in naturally-occurring language this is superior to using unaided intuition; even expert speakers are generally unable to predict language use accurately (Deignan, 2005). Text analysis is the detailed, qualitative study of patterns of form and meaning in texts. Text analysis complements corpus analysis, offering contextual detail and the analysis of fine-grained meaning that can be missed with corpus techniques.

The project will build three corpora, as follows:
(1) A corpus of research and policy texts in the various subfields of climate sciences produced within the last five years.
(2) A corpus of popular and educational materials in fields aligned as closely as possible to the first corpus, consisting of texts aimed at and accessed by young people, including curriculum materials, educational websites such as ‘BBC Bite-size’, popular science texts, internet forums,
Twitter feeds and other texts used by young people (selection informed by interviews with
them and with teachers).

(3) A corpus of transcribed interviews with young people aged between 11 and 16, in which they
discuss their understanding of the issue.
The corpus described in (1) will be approximately 500,000 words. The texts in corpus (2) will be, on
average, considerably shorter; for example, a typical article in “Focus”, a science magazine for young
people, is around 1500 words. Corpus (2) will therefore include approximately 300,000 words. The
corpus described in (3) will consist of around 200,000 words of transcribed interview data, made of up
approximately 40 interviews of around 30 minutes each (20 hours). All personal identities in Corpus (3)
will be anonymised. The texts will be organised so that they can be analysed separately or in batches if
required; for instance, in (2), it will be possible for texts from different sources to be analysed
separately. At a number of points in the study, we will also talk to science teachers about the process of
communicating and translating scientific ideas for young people. This will inform the selection of texts
for our corpora, and our analysis of them.

Copyright permission will be sought where required. This will apply to some texts in the first
two corpora. This is generally unproblematic for corpus studies, because the texts will not at any point
be made available to be read beyond the project team: the corpora will not be made publicly available.
Any extracts that are published in project outputs will not be longer than 400 words, and will generally
be considerably shorter, and are thus covered by fair-use provisions.

We will analyse the ways in which metaphorical and metonymical frames communicate
information, world-view (in particular evaluation and agency) and relationships between ideas, such as
compatibility, contrast, cause-effect and instrumentality. We will also analyse associated linguistic
features of the texts, such as collocational patterns, modality, function and use of technical language.
We will compare the analyses of the three datasets and identify commonalities and divergences in what
information and stance are communicated, through which linguistic mechanisms, and, using the third
dataset, consider how scientific information and stance are understood and reframed by young people.
We will use the analysis to identify general trends in the translation of scientific knowledge and stance
into popular and educational genres.

The three corpora will be analysed in various ways as follows. In the first stage, preliminary
analysis will involve automatic and manual techniques, in order to identify lines of analysis for full
searches, in procedures discussed in the literature on using corpora to investigate metaphor and related
phenomena (for example, Cameron & Deignan, 2003; Charteris-Black, 2004). These automatic
techniques will consist of identifying the most frequent word forms in each sub-corpus, using corpus
software (SketchEngine, https://www.sketchengine.co.uk/; WordSmith Tools v.6,
http://www.lexically.net/wordsmith/), to give an indication of the most frequent semantic themes. We will
also identify key semantic areas using WMatrix 3 (http://ucrel.lancs.ac.uk/wmatrix/), using techniques
developed by the one of the Co-is (Koller et al 2008). The Key Words function from WordSmith Tools will be used to compare
sub-corpora against each other. The Key Words tool compares word frequencies across any two
corpora and identifies word forms that are used significantly more frequently in one of the corpora
compared to the other. This gives a snapshot of the differences in language choices across corpora.
Manual text analysis of samples of each corpora will also be undertaken; this also gives an indication of
semantic and formal patterns to be investigated using automatic techniques. Each component of the
preliminary analysis will indicate language items to be studied across the full corpora.

The second stage of the analysis will use corpus linguistic techniques, principally concordance
and collocation analysis, to analyse in detail the linguistic features identified during the first stage. In
techniques pioneered by the PI (Tirkkonen, 2005), metaphorical and metonymical uses will be identified.
Metaphor and metonymy analysis will first identify the most frequent and salient groups of metaphors
and metonyms used within each corpus, and then identify metaphorical and metonymical frames and
their entailments. We will then analyse the most frequent collocations in each corpus, and linguistic
markers of evidentiality and probability. We will analyse words that the software identifies as frequent in
each corpus for evaluative meaning and function. We will use the British National Corpus, available
through SketchEngine, and the Oxford English Corpus, as reference corpora, that is, a guide to non-
specialised use as experienced by a typical language user, in order to inform our intuitions about typical
meanings and uses of words and structures.
In the third stage of the analysis, we will consider how the world-views constructed through the devices identified compare across the three corpora, and how knowledge, evaluation and stance has been constructed, reconstructed and translated across the different groups of language users.

We will interview science teachers of Key Stages 3 and 4 at a number of points in the project (see timetable below) to inform our choice of texts in the sections of corpus (2), and to establish: (a) their views on communicating, translating and reformulating scientific knowledge to young people, and (b) their opinions of our analysis of samples of the three corpora and our interpretation of them.

5. Management and co-ordination
The project crosses the disciplines of Applied Linguistics and Education. As applied linguists, the PI is a former teacher, and an expert in corpus linguistics, including corpus studies of figurative language, and the corpus analysis of language across different genres and registers in science (e.g. et al, 2013). The project requires expertise in the detailed examination of discourse, especially scientific texts, and especially the use of metaphor theory (2008, 2011). She also brings an established track record of managing funded projects and associated impact activities. The other Co-I is an educational researcher. She is a former secondary school teacher and currently works with science teachers and student teachers in local secondary schools. She has experience of funded research projects with secondary school pupils and teachers (e.g. et al, 2010, 2011).

As PI, will oversee all aspects of the management, planning and implementation of the project. will oversee the corpus collation, building, and analysis. She will also oversee the engagement, impact and dissemination activities. will be responsible for the detailed text analysis, will assist with the comparative analysis, and will carry out impact activities with groups other than educators. will oversee all aspects of data gathering from young people and teachers, and will advise on the linguistic analysis from a science and education perspective. She will also carry out impact activities with educators. An RA (0.6FTE) will be appointed. She will carry out data collection and corpus building. The RA will also transcribe the interviews that make up corpus (3). The PI and Co-Is will train the RA in the different aspects of data gathering, corpus building and analysis, and will conduct analysis on samples of the data with the RA. The RA will carry out a substantial proportion of the analysis, having been trained and under the supervision of the PI and Co-Is. The RA will be based at Leeds, and will visit Leeds at least fortnightly with and . The RA will visit Leeds at least five times during the project for review and planning meetings, and will also maintain contact with the Leeds investigators and RA by Skype and email on a less formal basis.

The project will benefit from an Advisory Group, which will meet face-to-face in Leeds to review and advise on progress at three points in the project, and which can be consulted less formally at other points. The following have agreed to join the group: Professor of Science Education, University of Leeds, PI on a number of science education projects; and Professor of Rhetoric and Communication, Lancaster University, author of three relevant books: Writing Biology: Texts in the Social Construction of Science (Wisconsin, 1990), Matters of Opinion: Talking about Public Issues (Cambridge, 2004) and Discourse of Blogs and Wikis (Continuum, 2010). We will also be recruiting local science teachers, representatives from science education publishers and examination boards, and curriculum advisors and designers.

Professor , Director of the ESRC-funded Centre for Corpus Approaches to the Social Sciences (CASS) at Lancaster University, has indicated that the project can be affiliated to CASS. Members of the project team already have links with CASS: is on the ‘Challenge Panel’ of outside experts advising on CASS’s work, and leads a project associated with CASS. This affiliation will give access to additional computational linguistic expertise held at CASS in technical areas such as automatically harvesting Twitter and online forum data (for the second corpus), and other specialist techniques that may be needed as the project proceeds.

6. Timetable
The project will encompass the following tasks:

1. Collect texts for Corpus 1: code, upload.
2. Interview secondary school pupils
3. Transcribe interviews to create Corpus 3
4. Collect texts for Corpus 2: code, upload
5. Corpus and text analysis of Corpus 1
6. Corpus and text analysis of Corpus 3
7. Corpus and text analysis of Corpus 2
8. Interview teachers
9. Comparative analyses of Corpora
10. Outputs, dissemination and impact activities

Timing of the tasks is as follows, starting from November 1st 2014:

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7. Outputs and dissemination
Through our science teacher education work at Leeds, we have close contacts with teachers and other education professionals, with whom we have discussed the project. We have also made contact with other user organisations such as the Royal Society and the UK Youth Climate Coalition.

We will present outputs at the Association for Science Education conference (UK, early 2016), ESERA (European Science Education Research Association, Helsinki, 2015); and at specialised linguistic conferences such as: Researching and Applying Metaphor (Leiden, 2015); International Conference of Corpus Linguistics (Lancaster, 2015).

We will write four journal articles, targeted at science communication journals such as Science Communication and Public Understanding of Science, at journals of science education such as Studies in Science Education and International Journal of Science Education, and at the specialised linguistic journals International Journal of Corpus Linguistics and Metaphor in the Social World. We will also submit articles discussing our findings for the non-specialised educated public to quality newspapers such as the Times Educational Supplement and the Guardian.

We will organise engagement and dissemination events for education professionals in the Yorkshire region. We will also hold a national event for curriculum developers, science journalists and policy-makers in London, at the Royal Society, following the model of the successful event for a similar group held by a previous funded project by Leeds staff (EISER) (see Pathways to Impact). We will seek advice from the AHRC Theme Fellow on extending the engagement and dissemination activities, and developing further research and impact projects, in collaboration with other projects funded under the theme where possible.

In terms of legacy, the project will create collaborative links between CASS’s corpus work at Leeds, the internationally-known expertise in Science Education, also at Leeds, and work at Lancaster, known for its applied linguistic and corpus excellence. The project aims to start a tradition of bringing language analytical techniques to the investigation of texts for young people, and to the consideration of intralinguistic translation of research to popular and educational genres.

8. Technical summary
8.1 Digital outputs
The project will produce a website, which will be linked to the investigators’ webpages and departmental websites, and to the CASS website at Lancaster University.

The project will produce the three corpora described above, which will be stored securely at Leeds. At present, we do not plan to make corpora (1) and (2) available beyond the project staff.
because of copyright issues. These corpora are not therefore considered to be an output of the project. A transcribed version of Corpus (3) will be made available to other researchers (see Technical Plan).

8.2 Digital Technologies

We will use three specialised pieces of software for processing the language data: WordSmith Tools v. 6; SketchEngine and WMatrix3. WordSmith Tools and SketchEngine are commercially available while WMatrix was developed and is owned by Lancaster University (see Technical University plan).

References


Technical plan: Translating science for young people

Section 1: Summary of Digital Outputs and Digital Technologies

Digital outputs
The project aims do not include the production of digital outputs. However, in the process of meeting its objectives, the project will produce three related digital databases. These are language corpora as follows:

- Corpus 1: research and policy texts in various subfields of climate sciences, produced within the last five years: approximately 500,000 running words;
- Corpus 2: popular and educational materials in fields aligned as closely as possible to the first corpus, consisting of texts aimed at and accessed by young people, including curriculum materials, educational websites such as 'BBC Bite-size', popular science texts, internet forums, Twitter feeds and other texts used by young people: approximately 300,000 running words;
- Corpus 3: transcribed interviews with young people aged between 11 and 16: approximately 200,000 running words.

It is not envisaged that Corpus 1 and Corpus 2 will be made available to other researchers, at least in the short term, because of copyright issues. Initially, we will obtain the necessary permissions to store the texts electronically for the purposes of this research project. However we will review this as the project progresses and in discussion with copyright holders. Copyright issues do not apply to Corpus 3, and we intend to allow free access to other researchers on request. The data collection and transcription of Corpus 3 will be carried out by the RA appointed to the project and is not therefore a separate cost.

Digital technologies
The corpora will be analysed using corpus linguistic software packages, described below. These are not outputs of the research.

Section 2: Technical Methodology

2a: Standards and Formats
The three corpora will be stored as text files (.txt), which is the usual format for use with corpus software. Files will be indexed and labeled so that they can be analysed separately or in batches, for example, by speaker or writer, publication source, date, topic, or genre. The disk space required for txt files is small; it is not a specific technical issue and has no associated cost.

2b: Hardware and Software
We will be using three software packages to analyse the data:
- SketchEngine
- WordSmith Tools v6
- WMATRIX

There is a certain amount of overlap between SketchEngine and WordSmith Tools v6. They perform similar corpus analytical functions such as frequency counts, concordancing and identifying collocations. However, each has strengths, and as they are relatively inexpensive, we will use both, for different aspects of analysis. WordSmith Tools is required for its Key Words function, enabling the comparison of corpora, while SketchEngine calculates and compares statistical measures of collocation exceptionally well, and can process large corpora very quickly.

WMATRIX processes corpus data in a number of ways. For the purposes of this project, we will be using its semantic tagger; WMATRIX can assign a semantic field label to each word in a corpus. It can then compare tags in corpora to identify semantic fields that are relatively over-used or under-used.

We will use these software packages to identify the most frequent words in our data, and to identify the most frequent word combinations. We will also identify words that are relatively more or less frequent in one corpus compared to another, and semantic fields that are relatively more or less frequent. We will use these results (together with detailed texts analysis of samples of the corpora) as starting points for detailed study of concordance and collocation data, for which we will use SketchEngine and WordSmith Tools. The only cost to the project is for two SketchEngine licences (see Justification of Resources) as we already have access to the other two packages.
These software packages run on conventional desktop and laptop PCs. No specialist hardware will be used.

2c: Data Acquisition, Processing, Analysis and Use
The timetable for data acquisition, processing and analysis is given in the Case for Support. The version given below indicates activities related to digital outputs and their processing in heavy shading, and other activities in light shading.

1. Collect texts for Corpus 1: code, upload.
2. Interview secondary school pupils
3. Transcribe interviews to create Corpus 3
4. Collect texts for Corpus 2: code, upload
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Corpus analyses are standard linguistic techniques, and the technical tools used do not raise special issues. The estimates of the duration of each stage have been based on the PI and one of the Co-Fs extensive experience of corpus projects. Data will be stored securely on the University of Leeds hard drive where it is backed up professionally on a daily basis.

Section 3: Technical Support and Relevant Experience
The PI is a very experienced corpus researcher, having written several widely-cited publications on the topic, and will be responsible for all technical aspects of the project. The project team are also able to call on additional corpus expertise within the School of Computer Science at Leeds University, if necessary. The project will be affiliated to the ESRC funded Centre for Corpus Approaches to the Social Sciences at Lancaster University (for which the PI is on the expert advisory panel), which will give the project team access to further specialized technical expertise.

Section 4: Preservation, Sustainability and Use
4a: Preserving Your Data
Corpus 1 and Corpus 2 will be preserved for the lifetime of the project but as explained in section 1, we cannot undertake as yet to make them freely available to the research community. Corpus 3 will be preserved beyond the lifetime of the project and will be made available to the academic community on request.

4b: Ensuring Continued Access and Use of Your Digital Outputs
Corpus 3 will be held at the University of Leeds for at least three years after the end of the project and until such time as we judge it to be too dated to be relevant to the research community. Storage costs are minimal as it consists of text files. The corpus consists of interviews with young people, which
though anonymised, could, potentially, be sensitive. For this reason, we do not intend to place it online for open access.
Justification of resources: Translating science for young people

Directly Allocated Staff costs: PI and Co-I time
A 20% contribution has been requested for the PI, 10% for the Leeds Co-I, and 5% for the Lancaster Co-I. Detailed justification is as follows:

[Text]

Directly Incurred Staff Costs: Research Assistant
We have requested an RA at 0.6 FTE. He/she will receive training as required for the project, and will normally attend all project meetings and interviews. Following enhanced Disclosure and Barring Service clearance, he/she will conduct interviews with school students, initially with [unnamed]; (approximately 20 hours of interviews). He/she will transcribe them for Corpus 3, and will also transcribe teacher interviews for reference. He/she will collect material for Corpus 1 and Corpus 2, establishing in each case whether copyright permission is required from holders and seeking this. He/she will conduct linguistic analysis under the supervision of the Investigators. He/she will assist in organizing engagement and impact activities, and will contribute as agreed with the PI. He/she will contribute to academic and non-specialized publications, as agreed with the PI (and as congruent with his/her career objectives). Over the project period of 20 months, we estimate that this constitutes 3 days/week, 0.6FTE. The linguistic analysis tasks are specialized and we are therefore seeking to appoint at Grade 7.

Directly Incurred Costs: Travel and subsistence
Travel and subsistence have been calculated using the standard rates applied by the University of Leeds. Funding is sought for the following:

For the project team

[Text]
We have included the costs for [redacted] to travel to give talks in schools/ at teacher INSET events in the West Yorkshire region to disseminate project findings, and to discuss implications for education and possible future work. We have budgeted for 5 trips at an average cost of £25 per trip. [redacted] and [redacted] will also travel to London twice to meet with Theme Fellow/ other grant holders to discuss impact and collaboration.

Travel, subsistence and accommodation for the project team to conduct the end-of-project event in London have also been included at University of Leeds rates.

We have requested funds to give talks at conferences. We will present findings at two science education conferences as part of our Pathways to Impact strategy, as well as to contribute to academic understanding of the field. The conferences are:

- European Science Education Research Association, Helsinki, 2015, for [redacted] and [redacted] as attendance at this conference, as an applied linguist, will contribute to the project team's collective understanding of how linguistics and science education can collaborate further.
- International Conference of Corpus Linguistics, Lancaster, 2015. We have requested the registration fee only for [redacted] and the RA, plus travel for the RA, as the other costs are covered by [redacted] and [redacted]'s association with the Corpus Approaches to Social Sciences centre at Lancaster.
- Researching and Applying Metaphor, Leiden, 2015. We have requested costs for [redacted] and the RA. [redacted] and [redacted] will each contribute papers on their different aspects of data analysis. Conference attendance will be developmental for the RA.

For other participants and users

The project will host four Advisory Group meetings at Leeds University. These will be a forum for engaging with users and obtaining their input on the research and the impact activities throughout the project, forming part of our Pathways to Impact strategy. Face-to-face meetings are needed for facilitating interaction, particularly between the academic and non-academic members of the group. We have therefore included a modest amount for catering and travel reimbursement for key participants.

To enable attendance and thus maximize impact and dissemination to key audiences, we have built in travel reimbursement for participants at Leeds end-of-project event for up to 20 of the 50 participants at up to £50 each. Key participants will include representatives of the UK’s Association of Science Education, examination boards and Local Authorities, and teachers/ head teachers and heads of science.

Other Directly Incurred Costs

As an incentive for participating in research, we are planning to pay the four participating schools a fixed amount of £500 per annum x 1.5 years. This is in line with market expectations, as determined for previous Leeds projects with participating schools.

We have included SketchEngine software licenses for 2 users (PI and RA), for 2 years. This software is necessary for the analysis of larger corpora. We will also be using WordSmith Tools, for which the departments at Leeds and Lancaster already have site licences. The third piece of software we will use, WMatrix, is owned by Lancaster.

As part of our user engagement and impact activities, we have funded for catering and room hire for an end-of-project event at Leeds University for 50 people (see above). We will also be holding an end-of-project event in London for 40 people, and have funded for room hire at the Royal Society. The cost is competitive for Central London, and the location is well equipped and prestigious, as well as convenient for many of the key users we wish to engage with.

We have funded in half-day teacher cover costs to be paid to participating schools to enable teachers to attend the four Advisory Board meetings. The teachers' contribution to the advisory meetings is essential because of the detailed contributions they can make regarding young people's interests and concerns, and for their potential to shape the direction of the data gathering, analysis and impact strategy. We have also included teacher cover costs to be paid to schools to enable teachers to attend the end-of-project Leeds event.
Pathways to impact: Translating Science for Young People

1. Objectives
Our research will produce better understanding of the translation of specialised knowledge into educational and popular forms, and of how young people re-interpret this knowledge. Our findings will be relevant to three groups in particular:

1. education professionals who work with young people studying science and the sociology of science, and more generally with science teaching, curriculum and examination in schools;
2. professionals involved in the communication of science, including scientists themselves, and writers about science such as science journalists, especially those who write for young people;
3. organisations concerned with the impact of scientific issues, especially climate change, on our daily lives.

We have started working with user groups, and will continue to seek advice from them as the project proceeds. They will help us in identifying data, by advising on our analysis of datasets (language corpora) and in comparison of corpora. They will also advise on the developing impact strategy and future developments from the research. Our impact strategy will be managed so as to involve user groups throughout the project.

We aim to disseminate and discuss findings in formats appropriate to the different groups, through events to be hosted in the Leeds/ West Yorkshire region and in London, and through presentations and publications for, and dialogue with, professional bodies and the interested public.

2. Communication and engagement with user groups
The project team already have relationships with some representatives of the above groups. One of the Co-Is (Dr [Name]) has contacts with the Association for Science Education, and the Institute of Physics. The project team have also made preliminary contact with the Royal Society and SCORE (Science Community Representing Education), and with the UK Youth Climate Coalition. Dr [Name] has relationships with schools and science teachers in the Yorkshire region and in London, and with other science education professionals nationally and internationally. Communication and engagement during and after the period of the research will build on these relationships and will develop new relationships with other stakeholders.

The project will appoint an Advisory Group, to include members from user groups as well as academic members, to meet face to face four times, as well as to be consulted as needed on a less formal basis (see Case for Support). Part of the group’s remit will be to advise on the development of the project and its impact activities and to evaluate, and modify and develop these if judged desirable.

The project will have its own website, which will provide information about the aims and objectives of the research, a guide to staff engaged with the research, access to presentations and working papers produced during the course of the project. Sections of the website will be designed to appeal to school students with an interest in socio-scientific issues, the language of science and English language variation (e.g. students following AQA’s A levels in “Science and Society” and “English Language”). The website will be created early in the project, and will include spaces for comments and contributions by readers. In this way we aim to introduce virtual dialogues around the progress of the project.

We will create ‘briefing’ documents to communicate information about the project’s findings and our website to stakeholder groups. These will be written in non-technical language and will act as a means to communicate with educated professional audiences as well as the general public. Summaries of our findings will be offered as contributions to the blogs and/or news sections of the websites of the organisations listed above and of other similar organisations.

The project team will hold regular meetings with local science teachers in two forums: (1) in their schools, as part of the research plan (see Case for Support) and (2) at Leeds University, as part of the Advisory Group. These meetings will inform both the progress of the research and the planning of dissemination activities. In addition, towards the end of the project, we will offer talks to teachers in the region (see below). We will also reach teachers and other education professionals through a presentation at one of the conferences of the UK’s Association for Science Education.
At the end of the project, several events will be held to disseminate our findings to individuals and members of organizations involved in science education and in the dissemination of science. Firstly, the team will give at least five talks for science teachers and pupils in secondary schools, and other interested education professionals in the Yorkshire region. We will offer these talks to schools and clusters of schools as part of their INSET programme and/or as after-school events. We will also offer two larger events, in Leeds and in London. The Leeds event, at the University, will invite particularly headteachers and science teachers from the region, (including but not limited to those that have participated in the study), school and University students with an interest in socio-scientific issues, as well as other science professionals, such as representatives of examination boards, based in the North of England. Participants will be invited to contribute to the event and to discuss future initiatives building on its findings.

The London event will be held at the Royal Academy to disseminate our findings to individuals and members of organizations involved in science education and in the dissemination of science. We will invite particularly: representatives of the UK’s Association of Science Education; representatives of organisations and charities involved in the dissemination of science, particularly to young people; science journalists, and particularly those writing for publications aimed at young people, such as *Focus*; representatives from the Department of Education with particular responsibility for science curricula.

Finally, we will utilise press relations expertise offered by the AHRC and the press offices of Leeds and Lancaster Universities to disseminate key project findings to relevant media outlets.

3. Capability
The PI will take overall responsibility for organising the impact activities. The PI and Dr [Name] will be particularly involved in impact and dissemination activities involving science teachers, students, the UK’s Association of Science Education and similar bodies. Both Professor [Name] and Dr [Name] have experience in the organisation of conferences and other events, and of working with and presenting to audiences of teachers. Additionally, Dr [Name], as PI and Research Fellow for various funded science education projects (see CV) has experience of engaging teachers and students in research projects, and of organising and contributing to significant dissemination events for professionals, such as head teachers and heads of science departments, and policy makers within the science education community. These include "Curriculum reform in the sciences: lessons from the EISER project", at the Royal Society in London, attended by 45 non-academic participants (2011; ESRC grant reference RES-179-25-0004). She also has extensive experience of working with science students as a researcher, teacher and teacher educator.

Professor [Name] will be particularly responsible for dissemination activities involving organisations that focus on the dissemination of science, and with making contact with policy makers. As PI of the ESRC-funded project ‘Metaphor in End of Life Care’ (2012-14, [http://curel.lancs.ac.uk/melec]), Professor [Name] has experience of a variety of user engagement activities, including: writing for non-academic audiences, such as the palliative care news website eHospice; organising events for research users, such as Lancaster University’s *Campus in the City* initiative and a high-profile User Event to be held at the Work Foundation in London in May 2014; and addressing academic audiences outside her main area of specialist, such as the 8th World Research Congress of the European Association for Palliative Care (Lleida, Spain, June 2014). Professor [Name] has also presented her work on language and chronic pain to health professionals and patients at the 2013 Conference of the UK Trigeminal Neuralgia Association.

The RA will be involved in drafting the impact and dissemination documents and project summaries under the supervision of the PI and the Co-Is, and in the organisation of meetings and the end-of-project events. The School of Education at Leeds University and the Department of Linguistics and English Language at Lancaster University have extensive experience of building and maintaining a web presence for research projects. The infrastructure for this is already in place within the universities.

4. Resource for the activity
Resources for all dissemination materials and activities are included in the financial summary and the justification of resources.