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## Signs of Access in a Digital World: Online Delivery of Deaf Studies Curricula in Ireland at Third Level,

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# Signs of Access in a Digital World: Online Delivery of Deaf Studies Curricula in Ireland at Third Level

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# Signs of Access in a Digital World: Online delivery of Deaf Studies Curricula in Ireland at Third Level

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## Abstract

*Irish Sign Language (ISL), an indigenous language of Ireland, is recognized by the European Union as a natural language. It is a language separate from the other languages used in Ireland, including English, Irish, and, in Northern Ireland, British Sign Language. Some 5,000 Deaf people use ISL. Given the history of suppression of signed languages across the EU, the average Deaf person leaves school with a reading age of 8.5 to 9 years. Given this, it is no surprise that Deaf people are the most under-represented of all disadvantaged groups at third level. This poses two challenges: (1) getting Deaf people into third level and (2) presenting education in an accessible form.*

*Two institutions, Trinity College Dublin (TCD) and the Institute for Technology, Blanchardstown, Dublin (ITB) have partnered to create a unique elearning environment based on MOODLE as the learning management system, in the delivery of Deaf Studies programmes at TCD. This partnership delivers third level programmes to students in a way that resolves problems of time, geography and access, maximizing multi-functional uses of digital assets across our programmes. Students can take courseware synchronously and asynchronously. We have built a considerable digital asset and plan to re-architect our framework to avail of current best practice in digital repositories with learning objects vis-à-vis ISL. Our digital assets include a corpus of ISL, the 'Signs of Ireland Corpus' which is one of the largest, most richly annotated in the world. We have operated online delivery since 2005, hosted by ITB, and in early 2008 were successful in attracting significant Irish government funding to expand delivery of a series of undergraduate diplomas to degree level nationwide under the Strategic Innovation Fund, Cycle II. The hallmark of this project is the delivery of blended learning, maximizing ICT in the teaching and learning of ISL. It is important to note that there are currently no other universities delivering Deaf Studies programmes with this degree of online content internationally. Thus, this programme and its associated research is cutting edge innovation in its philosophy, its rich content and its utilization of rich media.*

*Signed languages, by their nature, are visual-gestural languages, which (unlike spoken languages) do not have a written form. Given this, the online content is required to be multi-modal in nature and we utilize rich-media learning objects in our delivery. This presents a number of serious and important challenges. Specific challenges include:*

- *Universal design in an online curriculum for Deaf students*
- *Identifying what aspects of ISL learning can best be supported & assessed online*
- *Assessing signed language interpreting skill in an online context*
- *Decisions regarding ISL annotation & mark-up standards*
- *Using the Signs of Ireland corpus in blended learning contexts*
- *Leveraging a corpus within digital learning objects in a MOODLE environment*
- *Architecture of a digital learning environment to support ISL learning*
- *Issues of assessment in an elearning context*

*We are instigating a range of doctoral level studies linked to this project, focusing on the deployment of rich digital media as learning objects to support online delivery of Deaf Studies, the online assessment of ISL, and the phonological-morphological interface in ISL.*

## **1. Background**

This paper outlines the establishment and annotation of the Signs of Ireland corpus, currently the largest digital annotated corpus in Europe insofar as we are aware, and the success of the corpus to date in supporting curricula and research. This paper focuses on moving the corpus forward as an asset to develop in elearning and blended learning. This paper outlines the challenges inherent in this process, and outlines our plans and our progress to date in meeting these objectives. Our two institutions, Trinity College Dublin (TCD) and the Institute for Technology, Blanchardstown, Dublin (ITB) have partnered to create a Moodle-based elearning environment for the delivery of Deaf Studies programmes at TCD. This partnership delivers third level programmes to students such that students can take courseware synchronously and asynchronously.

### **1.1 Irish Sign Language**

Irish Sign Language is an indigenous language of Ireland. It is used by some 5,000 Irish Deaf people as their preferred language (Matthews 1996) while it is estimated that some 50,000 non-Deaf people also know and use the language to a greater or lesser extent (Leeson 2001). The Signs of Ireland corpus is part of the Languages of Ireland programme at the School of Linguistic, Speech and Communication Sciences, TCD. It comprises data from Deaf Irish Sign Language (ISL) users across Ireland in digital form, and has been annotated using ELAN, a software programme developed by the Max Planck Institute, Nijmegen. The corpus is housed at the Centre for Deaf Studies, a constituent member of the School.

While technology has opened the way for the development of digital corpora for signed languages, we need to bear in mind that signed languages are articulated in three dimensional space, using not only the hands and arms, but also the head, shoulders, torso, eyes, eye-brows, nose, mouth and chin to express meaning (e.g. Klima and Bellugi 1979 for American Sign Language (ASL); Kyle and Woll 1985, and Sutton-Spence and Woll 1999 for British Sign Language (BSL); and McDonnell 1996; Leeson 1996, 1997, 2001; O’Baioill and Matthews 2000 for Irish Sign Language (ISL)) leads to highly complex, multi-linear, potentially dependent tiers that need to be coded and time-aligned. As with spoken languages, the influence of gesture on signed languages has begun to be explored (Armstrong, Stokoe and Wilcox 1995, Stokoe 2001; Vermeerbergen and Demey (2007)), while discussion about what is linguistic and what is extra-linguistic in the grammars of various signed languages continues (e.g. Engberg-Pedersen 1993, Liddell 2003, Schembri 2003). While these remain theoretical notions at a certain level, decisions regarding how one views such elements and their role as linguistic or extra-linguistic constituents plays an important role when determining what will be included or excluded in an annotated corpus. Such decisions also determine how items are notated, particularly in the absence of a written form for the language being described.

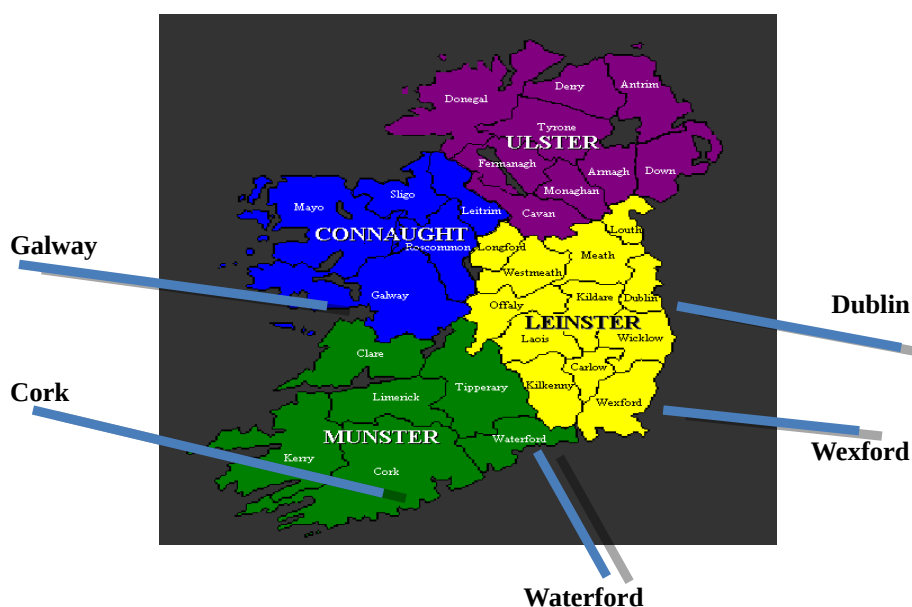
## **2. EUDICO Linguistic Annotator (ELAN)**

Originally developed for gesture research, ELAN (EUDICO Linguistic Annotator) has become the standard tool for establishing and maintaining signed language corpora. It is an annotation tool that allows one to create, edit, visualize and search annotations for video and audio data. ELAN was developed with the aim of providing a sound technological basis for the annotation and exploitation of multi-media recordings. (*ECHO Project*: <http://www.let.ru.nl/sign-lang/echo/index.html?http&&www.let.ru.nl/sign-lang/echo/data.html>)

### 3. The Corpus

The corpus currently consists of data from 40 signers aged between 18 and 65 from 5 locations across the Republic of Ireland. It includes male and female signers, all of whom had been educated in a school for the Deaf in Dublin (St. Mary's School for Deaf Girls or St. Joseph's School for Deaf Boys). None were sign language teachers, as we wished to avoid the collection of data from signers who had a highly conceptualized notion of 'correct' or 'pure' ISL. All use ISL as their preferred language and acquired it before they were 6 years. While some of the signers are native signers insofar as they come from Deaf families, the majority are not – and this reflects the reality for Deaf signed language users. Several contributors have Deaf siblings. The distribution of locations from where data was collected can be seen in Figure 1 below.

Data was collected by a female Deaf research assistant, Deirdre Byrne-Dunne. This allowed for consistency in terms of data elicitation and also meant that (due to the demographics of the Irish Deaf Community) Ms. Byrne was a known entity to all participants. This is evident in some of the on-screen interaction between informants and data collector, allowing for some interesting sociolinguistic insights. The fact that Ms. Byrne-Dunne is herself Deaf, and an established member of the Irish Deaf community, meant that the potential for 'Observer's Paradox' (Labov 1969) while not reduced, took on a positive spin: knowing who the interviewer/ recorder of data was, and knowing their status as a community member, lent itself to the informants opening up and using their 'natural' signs rather than a variety that they might have assumed a university researcher would 'expect' or 'prefer'.



**Figure 1: Sites for Corpus Collection (2004)**

It also meant that the informants who knew Deirdre, either as a former class-mate or from within the Deaf community, code-switched to use lexical items that would not typically be chosen if the interlocutor was unknown. For example, some 'school' signs were used (e.g. BROWN). And in other instances, informants, telling stories that they had self-selected, referred to Deirdre during the recounting of their personal stories. We also asked participants to tell 'The Frog' story, which is a picture sequence format telling the story of a

young boy who, with his dog, searches for his frog, which has escaped from a jar. Informants were also asked to sign the content of the Volterra picture elicitation task, a series of 18 sets of paired pictures showing a series of situations that aim to elicit transitive utterances. Both the ‘frog’ story and the Volterra picture elicitation task have been used widely in signed language specific descriptions and in cross-linguistic comparisons, including ISL (e.g. Leeson 2001; Johnston, Vermeerbergen Schembri and Leeson (2007); Volterra et al. 1984; Coerts 1994).

#### **4. Annotating the Corpus**

One of the myths of annotating data is that the annotators are neutral with respect to the data and that they simply ‘write down what they see’. ISL does not have a written form, so there is no standard code for recording it. While some established transcription keys exist (HamNoSys, Sign Writing, Stokoe Notation), none of these are compatible with ELAN and none are fully developed for ISL. Another issue is that these transcription systems are not shared ‘languages’ – that is, in the international sign linguistic communities, these transcription codes are not conventionally used, and to use one in place of a gloss means limiting the sharing of data to an extremely small group of linguists. However, glossing data with English ‘tags’ is also problematic. Pizzutto and Pietrandrea (2001) point out the dangers inherent in assuming that a gloss can stand in for an original piece of signed language data. They note that “It is often implicitly or explicitly assumed that the use of glosses in research on signed [languages] is more or less comparable to the use of glosses in research on spoken languages ... this assumption does not take into account, in our view, that there is a crucial difference in the way glosses are used in spoken as compared to signed language description. In descriptions of spoken (or also written) languages, glosses typically fulfill an ancillary role and necessarily require an independent written representation of the sound sequence being glossed. In contrast, in description of signed languages, glosses are the primary and only means of representing in writing the sequence of articulatory movements being glossed” (2001: 37). Later, they add that “ ... glosses impose upon the data a wealth of unwarranted and highly variable lexical and grammatical information (depending upon the spoken/written language used for glossing).” (ibid: 42). Thus, the glossing of signed data is problematic, even with a highly trained team who cross-check annotations as ours did. The Signs of Ireland project appears to be unique in that *all* annotated data was verified by a Deaf research assistant who holds a masters degree in applied linguistics.

ELAN allows for the stream of signed language data to run in a time-aligned fashion with the annotations, but a key challenge is that any search function is restrained by the consistency and accuracy of the annotations that have been inputted. For example, several ISL signs may be informally glossed in the same way, but the signs themselves are different, for example, WHAT (1), which is articulated using two hands, both taking an ‘L’ handshape, and having contact at c. locus. This is considered the ‘citation form’ of the sign:

QuickTime™ and a  
TIFF (LZW) decompressor  
are needed to see this picture.

**Figure 2: WHAT (1)**

QuickTime™ and a  
TIFF (LZW) decompressor  
are needed to see this picture.

**Figure 3: WHAT (2)**

In contrast, WHAT (2) is articulated on one hand, with the palm facing the signer. The middle finger wiggles a little in articulation. This is considered to be an informal variant - for example, it would not usually be taught in a formal ISL class. The fact that both of these signs are glossed in the same way demonstrates that any frequency count that would subsequently be carried out using ELAN would not distinguish between the two on the basis of the gloss, WHAT, alone. Instead a global count for WHAT (incorporating both variants) would result. The tagging of items for grammatical function poses another challenge: we have not tagged the SOI data for linguistic function because we do not yet know enough about ISL to accurately code to that level. Despite this, our annotations do reflect assumptions about the nature and structure of certain items. We have also taken seriously concerns arising from early codification of signed languages (Van Herreweghe and Vermeerbergen 2004).

Despite the fact that we wanted to avoid making assumptions about word class and morpho-syntax, the act of annotating a text means that certain decisions have to be made about how to treat specific items. For example, we know that non-manual signals, articulated on the face of the signer, provides information that assists in parsing a message as for example, a question or a statement, or in providing adverbial like information about a verbal predicate (e.g. Leeson 1997; O’Baioill and Matthews 2000, Sutton-Spence and Woll 1999, Brennan 1992, Deuchar 1984; Liddell 1980). When annotating such features, we had to make decisions about whether we would treat non-manual features as dependent tiers, relative to the manual signs that they co-occur with, or as independent tiers containing information that may be supra-segmental in nature. We decided to treat all levels as independent of each other until we could ascertain a relationship that held consistently across levels.

At the lexical level, we had to decide on what constitutes a word in ISL. While established lexical items with citation forms in dictionaries or glossaries of ISL were ‘easy’ to decide on, there was the issue of how to determine if a sign was a ‘word’ or a ‘gesture’ or part of a more complex predicate form, often described as classifier predicates. The fact that some signers used signs related to their gender or age group challenged us: we had to decide if a sign that was ‘new’ to us was a gendered variant (Le Master 1990, 1999-2000, Leeson and Grehan 2004), a gendered generational variant (Le Master *ibid*, Leonard 2005), a mis-articulation of an established sign (i.e. a ‘slip of the hand’ (Klima and Bellugi 1979), an idiosyncratic sign, a borrowing from another signed language (e.g. BSL), or a gesture. Our team’s expertise helped the decision making process here and all decisions were recorded in order to provide a stable reference point for further items that challenged that shared characteristics with items that were discussed previously.

The use of mouth patterns in signed languages provide another challenge for annotators working with signed languages. Mouthings and mouth gestures have been recognized as significant in signed languages, and while mouthings are often indicative of the language contact that exists between spoken and signed languages, mouth gestures are not (for example, see Boyes Braem and Sutton-Spence 2001, Sutton-Spence 2007). Given that the Signs of Ireland corpus will, in the first instance, be used by researchers looking at the morpho-syntax of the language, we opted to not annotate the mouth in a very detailed manner. Instead, we have provided fairly general annotations following from those listed in the ECHO project annotations list.

### 5. Use of the Signs of Ireland corpus in elearning/ blended learning contexts

The Signs of Ireland corpus has been piloted in elearning and blended learning at the Centre for Deaf Studies in the academic years 2006-7 and 2007-8 across a range of courses, but specifically, Irish Sign Language courses, an introductory course focusing on the linguistics and sociolinguistics of Irish Sign Language, and a final year course that focuses on aspects of translation theory and interpreting research (TIPP). At present the corpus exists on each client-side computer. Students are provided with training in how to use ELAN in order to maximize use of the corpus. The implications of this are that students must be able to access the corpus in a lab, presenting a challenge for blended learning delivery where students require Internet access to the corpus.

This also creates challenges in terms of data protection legislation, distribution, copyright and general access issues that need to be resolved as we move forward. For example, subsets of the data are already used as digital learning objects, but no decision has yet been made regarding optimal management and deployment of the corpus. We have developed assessments to Council of Europe Common European Framework of Reference level B1 (productive/ expressive skill) and B2 (receptive/ comprehension skill) level for ISL. This includes a receptive skills test which includes multiple choice questions linked to data taken from the Signs of Ireland corpus.

The corpus data sits amid other test items, which are outlined in Table (1) below:

Test Item	Domain	Duration	Test Format
Multiple Statements	Life Experience	1 1/2 minutes video (10 minutes)	Visual images (10 items)
The Deaf Summer Camp (SOI)	Life Experience Travel Deaf Current Affairs	1 minute video (10 minutes total)	MCQ Paraphrase True/False Qs Pen & paper (10 items)
“My Goals”	Ambitions / Professional Focus	1 minute video (10 minutes total)	MCQ Paraphrase True/False Qs Pen & paper



			(10 items)
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**Table 1: Sample ISL Receptive Test Using Digital Objects**

We also use the corpus as part of the continuous assessment of students in our Introduction to the Linguistics and Sociolinguistics of Signed Languages course. For example, students are required to engage with the corpus to identify frequency patterns, distribution of specific grammatical or sociolinguistic features (e.g. lexical variation) and to draw on the corpus in preparing end of year essays. In the Translation and Interpreting: Philosophy and Practice course, students engage with the corpus to explore issues of collocational norms for ISL, look at the distribution of discourse features and features such as metaphor and idiomatic expression (See Leeson 2008 for further discussion).

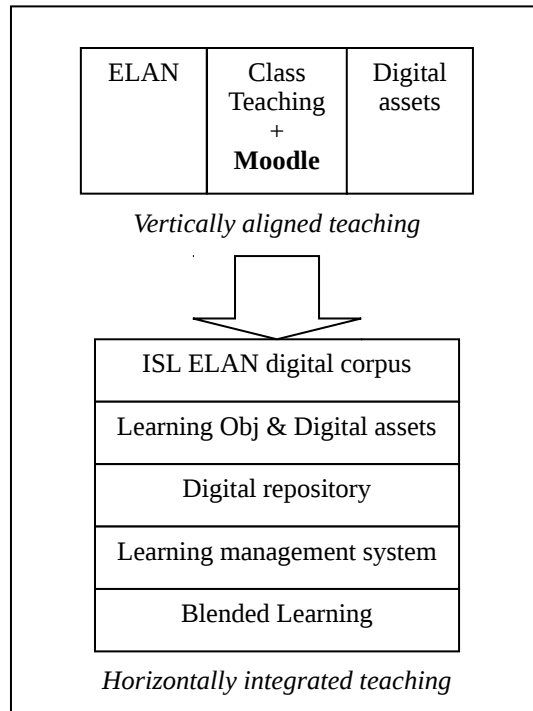
### **6. Leveraging a Corpus and Digital Learning Objects**

To optimally leverage the Signs of Ireland corpus within a learning environment, we will initially begin by determining what the actual functional requirements are with respect to how the application will be used by both students and academics in the blended learning context. At the moment, Moodle is populated with a wide variety of modules delivered within the suite of CDS undergraduate programmes. The Signs of Ireland digital corpus is tagged in ELAN. We have traditional classroom and blended delivery of content. The present programme architecture is very vertical in orientation (Figure 4). The challenge is to achieve horizontal integration through the use of information technology, the Internet and a blended learning approach.

### **7. Architecture of an online MOODLE environment to support signed language learning**

Planning is also required with respect to the overall architecture and framework. We are in the process of determining what profiling and other user related information we require to capture and tag data regarding the user environment and their interaction with the digital classroom and curriculum.

Additionally, we have started the analysis that will indicate (i) types of learning objects required for each lecture for each of the programme's modules and (ii) number and type of items, with the intention of making our blended learning Diplomas and Degrees available online from September 2009. Our initial base assumption is that target client devices are browsers on Internet aware laptops and desktops. This assumption can be expected to evolve, over time, into mobile devices such as the Apple iPhone, iPod Touch and similar computing appliances. This will deliver to us a plan for the capture and creation of the respective digital rich media that we intend to deploy within our learning objects.



**Figure 4: The integrated model**



**Figure 5: A MOODLE Screenshot**

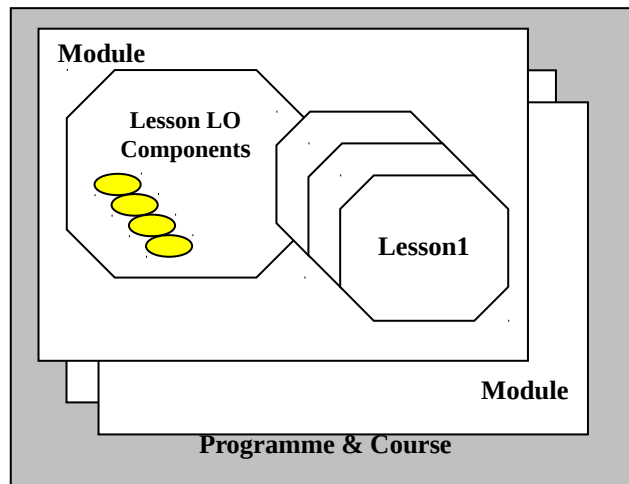
### **8. Issues of Assessment in an elearning Context**

We are also developing an assessment model, based on best pedagogical practice as appropriate to our online blended learning environment. From there, as an integral part of our design phase, we will determine how to implement this online. We will need to link, in a principled and structured way, the assessments to the learning outcomes of individual modules, for example, An Introduction to the Linguistics and Sociolinguistics of Signed Languages, and to a particular lecture's thematic learning outcomes as appropriate. We also consider the effectiveness of the assessment with students in a blended learning

situation.

## 9. Moving Forward

Our Strategic Innovation Fund (SIF II) Deaf Studies project is scoped for a three-year window commencing in 2009. A challenging year one plan has been created that will yield infrastructure changes, achievements and digital assets as well as the approval of a four year degree in Deaf Studies; ISL Teaching, and ISL/English Interpreting. We are presently completing an analysis phase to identify the learning objectives of a particular lecture and its themes on a week-by-week basis for each of the modules taught in year one. For example, week 1, lecture 1 has learning objectives LO1, LO2 and LO3, etc. Typically, this will broadly equate with a lecture plan that is rolled out over a semester. For example, the module 'An Introduction to the Linguistics and Sociolinguistics of Signed Languages' is delivered over two semesters totaling 24 weeks with 24 2-hour lectures over the academic year. We will need to make explicit the learning objectives of each of these lectures such that each objective may be supported by up to, say, four learning objects initially (Figure 6).



**Figure 6: Learning object components as a unit within a module**

These learning objects are expected to form a composite unit, but will be made up of different media types. A composite unit, therefore, will be expected to include the lecture notes (.pdf or .ppt), Moodle quizzes and exercises, video data of signing interactions (in Macromedia Breeze, Apple QuickTime and/or other formats), and ELAN digital corpora. To make a composite unit, each learning object needs to be wrapped with proper tagging. This tagging will facilitate searches for these learning objects within a digital repository. We plan that this will be done for all modules across all weeks.

We will identify and implement appropriate assessment models for a blended learning delivery of signed language programmes. This will be aided by our participation in the Leonardo da Vinci funded D-Signs Programme, led by Bristol University (see [www.bris.ac.uk/deaf/english/research/active/active02.html](http://www.bris.ac.uk/deaf/english/research/active/active02.html)). In addition to an assessment model, we will need to devise a model for determining the overall effectiveness of the programme within the blended learning approach that will take a more holistic and pedagogical perspective to the programme objectives. We intend to deploy this programme nationally following from initial Dublin based trials. When this national deployment occurs these effectiveness key performance indicators will assume a greater importance that will enable us to determine the answer to the question: Are we successful with this programme and how can we tell?

Following from our initial trial period, and with a sufficiency of initial data, we will compare and contrast assessments with anonymous (but marked for age and social background, gender, hearing status, etc.) and start to compare longitudinal figures with the initial first year outputs for this blended programme. As this programme is to be modeled for a blended learning environment, we will need to build in a model of student support to include in an appropriate way, online college tutors, peer-learning and mentoring, in order to address any retention issues that may arise and provide the students with the ingredients of their learning success within a productive and engaging community of practice.

We intend to create a website for this SIF II Deaf Studies Project with links to the learning management system/Moodle, other technology platforms including, for example, Macromedia Breeze, and the rich digital media assets as we determine to be useful in support of the teaching of Irish Sign Language within 3<sup>rd</sup> level education. We will also use this website to disseminate programmatic and research outcomes and other relevant information. We will address the technology related issues pertinent to the design and implementation of the framework for digital learning objects in a repository to facilitate access-retrieval, update, and search. We will determine the tagging standards that will operate across this. While we will deploy the blended learning approach initially in the Dublin area, we will also start planning for national deployment. We will therefore pilot data in the Centre for Deaf Studies in Dublin from September 2008 as supplementary to traditional modes. We will capture feedback from students and analyse this critically. Following this, we will rollout in selected region/s across the country via local 3<sup>rd</sup> level institutes of higher education in 2009-10. We have agreements with many of these secured at this time.

In terms of the human resources required to build the framework and create the digital assets for the full programme, and the appropriate skill-levels required, we will shortly be seeking to recruit a number of individuals with postgraduate qualifications with a specific research focus. These individuals will be required to determine the appropriate assessment models and how this can be implemented for elearning, backed up by a digital repository of learning objects that leverage the Signs of Ireland digital corpus. We have recruited a Deaf co-coordinating project manager with relevant post-graduate qualifications. He has excellent people-influencing skills and is a bilingual/bi-cultural ISL/English user. He has good organizational and financial management skills and can leverage key community insights with empathy and diplomacy – an essential requirement for the project at hand. In time, we will recruit academic staff for local delivery of ISL in the regions, interpreting lecturer/s and also general Deaf Studies academic/s. We will recruit an elearning/ digital repository/ digital media specialist as well as ISL/English interpreters. Additionally, to contribute to the research of the programme, we intend to recruit at Ph.D level to investigate the following research areas: 1) Assessment models appropriate to ISL in an elearning and blended learning context; 2) Developing and maturing the Signs of Ireland corpus, including meta-tagging and enriching the data; 3) Signed language/spoken language interpreting; 4) Design and build of rich digital media for Irish Sign Language. There are considerations regarding the cultural and work practice implications for academic staff delivering curricula in this manner. There are also corresponding implications for students receiving education in a blended learning approach via elearning technology. What will assume a greater importance immediately for academics and students is the minimum level of computer literacy skills and access to modern computing equipment and a fast broadband network required to engage in this kind of learning environment. We also plan, therefore, to devise a training programme for academic staff to induct them into the new teaching and learning environment and plan for a similar induction for students enrolled on the programme.

## 10. Summary

In this paper we have discussed decisions we have made regarding annotation of the Signs of Ireland corpus. We discussed ongoing work to place Irish Sign Language learning online through the application of MOODLE as the platform of choice as we move forward. We outlined the range of applications currently made with respect to the Signs of Ireland corpus in elearning/ blended learning contexts. We indicated how we will leverage the corpus within a framework for elearning and blended learning, situated in an online architecture to support signed language learning. Issues of assessment in an elearning context were also addressed.

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