Choice and Attainment in Gaelic-medium primary and early secondary education
Fiona O’Hanlon, Wilson McLeod, Lindsay Paterson, The University of Edinburgh

This briefing summarises the results of a research project which investigated:
(i) why people choose or do not choose Gaelic-medium education and (ii) the effects of Gaelic-medium education on pupils’ attainment. The data on attainment was gathered in the 2006-07 and 2008-09 school years. The data on choice was gathered in the 2008-09 and 2009-10 school years.

What is Gaelic-medium Education?

Gaelic-medium primary education begins with an immersion phase in which children study all of their subjects through the medium of Gaelic. English is typically introduced towards the end of Primary 3, but Gaelic remains the predominant language of learning throughout primary. The aim is that pupils achieve broadly equal competence in Gaelic and English by the end of primary school. At the secondary school stage, pupils who were in Gaelic-medium primary education typically study Gàidhlig (Gaelic as a subject for fluent speakers). In some secondary schools, other subjects are also provided through the medium of Gaelic for Gaelic-medium pupils.

History of Recent Gaelic-medium Education

Gaelic-medium education in Scotland started in 1985. Pupil numbers increased rapidly until the late 1990s and since then have grown more slowly. In session 2011-12, there were 2,418 pupils in Gaelic-medium primary education and 1,104 pupils taking Gàidhlig for fluent speakers at secondary school. Some pupils acquire Gaelic at home, but most do not, and thus start pre-school Gaelic medium education without any understanding of the language.

Roghainn agus Buileachadh ann am foghlam meadhain-Ghàidhlig sa bhun-sgoil agus tràth san àrd-sgoil
Fiona O’Hanlon, Wilson McLeod, Lindsay Paterson, Oíltigh Dhùn Èideann

Tha a’ bhileag fiosrachaidh seo a’ toirt seachad geàrr-chunntas air toraidhean pròiseact rannsachaidh air (i) carson a bhios, no nach bi, daoine a’ tagadh foghlam tro mheadhan na Gàidhlig agus (ii) a’ bhuaith a th’ aig foghlam meadhain-Ghàidhlig air buileachadh nan sgoilearan. Chaith an dàta air buileachadh a chruinneachadh anns na bliadhnaichean sgoil 2006-07 agus 2008-09. Chaith an dàta air roghainn a chruinneachadh anns na bliadhnaichean sgoil 2008-09 agus 2009-10.

Dè tha ann am Foghlam Tro Mheadhan na Gàidhlig?

Tha foghlam tro mheadhan na Gàidhlig sa bhun-sgoil a’ tòiseachadh le greis ‘bogaidh’ nuair a dh’ionnsaicheas a’ chlann a h-uile cuspair tro mheadhan na Gàidhlig. Mar as trice bidh Beurla ga toirt a-steach faisp air deireadh Prìomh 3, ach is i a’ Ghàidhlig am priomh chànan ionnsaicheadh tro bhliadhnaichean na bun-sgoile air fad. Is e an t-amas gum bi an aon chomas aig sgoilearan sa Ghàidhlig agus sa Bheurla mus cuir iad croich air a’ bhun-sgoil. Aig ire na h-àrd-sgoile, mar as trice bidh sgoilearan a fhuaire foghlam meadhain-Ghàidhlig sa bhun-sgoil a’ déanamh Gàidhlig do dh’fhileantaich mar chuspair. Ann an cuid de sgoileanta thèid cuspairean eile a thabhann tro mheadhan na Gàidhlig cuideachd airson sgoilearan meadhain-Ghàidhlig.

Eachdraidh Foghlaim Mheadhain-Ghàidhlig o Chionn Ghoirid

Thòisich foghlam tro mheadhan na Gàidhlig ann an Alba ann an 1985. Chaith aireamh nan sgoilearan an-àirde gu luath gu deireadh nan 1990an agus tha iad air a bhith ag èirigh nas slaodach bho am sin. Anns an t-seisean 2011-12, bha 2,418 sgoilean ann am foghlam bun-sgoile meadhain-Ghàidhlig agus 1,104 sgoilear a’ déanamh Gàidhlig do dh’fhileantaich anns an árd-sgoil. Bidh cuid de sgoilearan a’ togail na Gàidhlig aig an taigh, ach cha bhí a’ mhòr-chuid, agus bidh iad san a’ tòiseachadh ann am foghlam ro-sgoile meadhain-Ghàidhlig gun tuigse sam bith air a’ chànan.
In the 2011-12 school year there were two free-standing Gaelic primary schools and 58 Gaelic streams in primary schools that also provided English-medium education. 35 secondary schools taught Gàidhlig for fluent speakers and approximately half of these additionally provided one or more secondary school subjects through the medium of Gaelic. In this briefing, we refer to secondary-school pupils who are taking Gàidhlig for fluent speakers as Gaelic-medium pupils, in accordance with Bòrd na Gàidhlig's classification (Galloway 2012).

Aims of the Research

The research had two aims:

To investigate the reasons why people choose or do not choose Gaelic-medium education at the primary and early secondary school stages.

To investigate Gaelic-medium pupils' attainment in primary and early secondary school, and to compare this with the attainment of their English-medium counterparts.

What the Research Did

Approach to investigating choice

Eight primary-secondary school pairs were selected, covering the range of contexts in which Gaelic-medium education is provided. Interviews were conducted with the schools' headteachers and Local Authority Gaelic advisers (22 in total), with 55 parents of pupils in Primary 7 or Secondary 2 Gaelic medium and with 30 parents of pupils in Primary 7 or Secondary 2 English medium.

Approach to investigating attainment

Pupil attainment was studied mainly using two surveys managed by Scottish Government statisticians in 2007: the Scottish Survey of Achievement 2007 and the 2007 Scottish Survey of Achievement Gaelic-medium Survey. These enabled comparison of the attainment of Gaelic-medium pupils in Primary 5 and Primary 7 (168 and 140 pupils respectively) with three groups of Primary 5 and Primary 7 English-medium pupils:

(i) All English-medium pupils in the Scottish Survey of Achievement's national sample (7,631 Primary 5 and 7,829 Primary 7 pupils).

(ii) English-medium pupils chosen to match the Gaelic-medium pupils with regard to gender, socio-economic status and local authority area (164 Primary 5 and 149 Primary 7 pupils).

Anns a' bhliadhna sgoile 2011-12 bha dà bhun-sgoil làn-Ghàidhlig agus 58 sruth Gàidhlig ann am bun-sgoiltean a bhà a' tabhann foghlam meadhain-Bheurla cuideachd. Bha 35 àrd-sgoil a' teagasc Gàidhlig airson fhileantach agus bha mu dhàrna leth dhiubh sin cuideachd a' tabhann aon chuspair eile no barrachd tro mheathan na Gàidhlig. Anns a' bhileig fiosrachaidh seo is e sgoilearan meadhain-Ghàidhlig a th' againg air sgoilearan àrd-sgoile a tha a' déanamh Gàidhlig do dh'fhileantachtaidh, a rèir rangaichadh Bòrd na Gàidhlig (Galloway 2012).

Amasan an Rannsachaidh

Bha dà amas aig an rannsachadh:

Sgrùdaradh a dhèanamar air na h-adhbhara a bhios, no nach bi, daoine a' taghadh fhoghlam tro mheathan na Gàidhlig aig ire na bun-sgoile agus bliadhnaichean tràth na h-àrd-sgoile.

Sgrùdaradh a dhèanamar air buileachadh sgoilearan meadhain-Ghàidhlig sa bhun-sgoil agus bliadhnaichean tràth na h-àrd-sgoile, agus coimeas a dhèanamh eadar seo agus buileachadh sgoilearan ionnan riutha ann am foghlam meadhain-Bheurla.

Na Rinn an Rannsachadh

Modh-obrach anns an sgrùdaradh roghainn

Thaghadh ochd paidhricean bun-sgoile is àrd-sgoile, a’ riodhchadhadh an raon shuidheachaidhean far a bheil fhoghlam tro mheathan na Gàidhlig ga thabhann. Rinneadh agallamh le ceannardan nan sgoilean agus comhairlichean Gàidhlig nan Ùghdarrasan Ionadail (22 uile gu lèir), le 55 pàrant sgoilearan meadhain-Ghàidhlig ann am Prìomh 7 (P7) no Bliadhna 2 den àrd-sgoil (AS2) agus 30 pàrant sgoilearan meadhain-Bheurla ann am P7 no AS2.

Modh-obrach anns an sgrùdaradh buileachaidh

Rinneadh sgrùdaradh air buileachadh sgoilean, a’ cleachadh, airson na mòr-chuid, dà shuirbhidh a rinn luchd-statistitearachd Riaghaltas na h-Alba ann an 2007: an Suirbhidh Albannach air Coileanadh 2007, agus an Suirbhidh Albannach air Coileanadh ann am Foghlam Meadhain-Ghàidhlig 2007. Thug seo cothrom dhùinn coimeas a dhéanamh eadar buileachadh sgoilean meadhain-Ghàidhlig ann am Prìomh 5 agus Prìomh 7 (168 agus 140 sgoilean an urra) agus na tri buidhmeanan sgoilean meadhain-Bheurla P5 is P7 aleanas:

(i) A h-uile sgoilear meadhain-Bheurla anns an t-sampall nàiseanta aig an t-Suirbhidh Albannach air Coileanadh (7,631 sgoilear Prìomh 5 agus 7,829 sgoilear Prìomh 7).

(ii) Sgoilearan meadhain-Bheurla a thaghadh airson freagradh ris na sgoilearan meadhain-Ghàidhlig a rêir gnè, inbhe shòisio-eaconamach agus sgire ùghdarrais ionadail (164 sgoilear P5 agus 149 sgoilear P7).
A postal survey of primary schools with Gaelic-medium provision and secondary schools which provide Gàidhlig for fluent speakers as a subject was also undertaken to gather information about attainment in Primary 3, 5 and 7 and Secondary 2 in session 2008-09. This survey was conducted by the researchers.

Findings: Choice

Choice of Gaelic-medium education

There were two main reasons why people chose Gaelic-medium education. The first was heritage: of family, community or nation. In relation to family heritage, one parent noted of her choice for Gaelic-medium education for her daughter:

I just wanted her to have Gaelic because it was my first language … and I really just didn’t want the language to die out in my family.

Other parents regarded themselves as a ‘lost generation’ who had missed out on the family language, and thus wanted their children to acquire it. One parent noted:

My grandparents were native speakers and both lost it. We just felt it was a shame that we hadn’t learnt it, that my father hadn’t learnt it and then I hadn’t learnt it, and I just thought of all these people that lost the chance. So we just decided to try Gaelic medium.

Some parents cited connections to communities where Gaelic is spoken. Several linked the choice of Gaelic-medium education to a wider interest in Scottish culture, and a belief that Gaelic is an essential part of Scottish identity.

The second main set of reasons for the choice of Gaelic-medium education was the perceived benefit of a child’s becoming bilingual. Many parents had read about the research on bilingual education and bilingualism which suggests that being bilingual stimulates children’s learning. One parent noted:

I read up on it [Gaelic-medium education] and what I read was very positive about the impact of being bilingual on children and their ability to learn. So I thought it [Gaelic-medium education] was worth the effort.

Two other reasons were mentioned in relation to the choice of Gaelic-medium schooling. One was that Gaelic-medium education attracted a particular kind of highly educated parent who thinks about education. Joining a body of such parents was then

Toraidhean: Roghann

A’ roghnachadh foghlam tro mheadhan na Gàidhlig

Bha dà phriomh adhbharr a roghnach a dàoine foghlam tro mheadhan na Gàidhlig. B’ e dualchas a’ chiad adhbharr: dualchas teaghlaich, coimhearsnachd no nàisein. A thaobh dualchas teaghlach b’ e beachd aon phàrant mu bhith a’ roghnachadh foghlam meadhain-Ghàidhlig do a nighean:

I just wanted her to have Gaelic because it was my first language … and I really just didn’t want the language to die out in my family.

Bha cuid a’ faireachdainn gu robh iad nam pàirt de ‘ghinealach caillte’ nach d’ fhuaire cothrom cànan an teaghlach ionnsachadh, agus bha iad airson ‘s gum biodh i aig an cuid claoniuin. Thuirnt aon phàrant:

My grandparents were native speakers and both lost it. We just felt it was a shame that we hadn’t learnt it, that my father hadn’t learnt it and then I hadn’t learnt it, and I just thought of all these people that lost the chance. So we just decided to try Gaelic medium.

Bhruidhinn pàrantan eile air dàimh ri coimhhearsnachd far a bheil Gàidhlig ga bruidhinn. Bha grunn a’ dèanamh ceangal eadar foghlam Gàidhlig agus an uideann an cul tar a h-Alba san fharsaingeachd, agus iad den bheachd gu bhel a’ Ghàidhlig aig cride fein-aithne na h-Alba.

B’ e an dàrna priomh adhbharr airson foghlam tro mheadhan na Gàidhlig a thaghadh am beachd gu robh e na buannachd do leanabh a bhith dà-chànanach. Bha mòran phàrantan air leughadh mun ranannachadh air dà-chànanas agus foighlam dà-chànanach a tha a’ nochdadh gu faodadh dà-chànanas ionnsachadh leanaih a bhrosnachadh. Thuirnt aon phàrant:

I read up on it [Gaelic-medium education] and what I read was very positive about the impact of being bilingual on children and their ability to learn. So I thought it [Gaelic-medium education] was worth the effort.

Chaidh dà adhbharr eile a thogail a thaobh roghnachadh foighlam tro mheadhan na Gàidhlig. B’ e aon gu robh foighlam tro mheadhan na Gàidhlig tarraingeach do chuid de phàrantan sàr fhoghlamaichte a bhios a’ smaoineachadh gu domhainn mu dheidhinn foighlam.
attractive to other parents. The other was simply continuity (from pre-school to primary or primary to secondary): once pupils were in the Gaelic-medium system, continuing in Gaelic-medium education was seen to be a ‘natural progression’ for some parents. For others, there was reluctance to ‘lose’ or to ‘waste’ the Gaelic that their child had learnt at the previous school stage.

Choice of English-medium education

The research also investigated why people do not choose Gaelic-medium education when it is available. One reason was that parents were not able to choose Gaelic-medium education if they moved from an area where there was no Gaelic-medium provision to an area where it is provided after their children had missed the nursery and Primary 1 entry points into Gaelic-medium education.

Another common reason for choosing English medium was some non-Gaelic speaking parents’ fear that they could not help their child with homework in a language they did not understand.

Some English-medium parents, although favouring the revitalisation of the Gaelic language, doubted if education was the best means to language maintenance, and thus had not chosen Gaelic-medium education for their child.

Findings: Attainment

Attainment in English by Gaelic-medium and English-medium pupils

Pupils in Gaelic-medium education, who are not exposed to English in the classroom until at least Primary 3, catch up with and overtake English medium pupils in their command of English. By Secondary 2, whereas just over one half of English medium pupils had reached the expected level E in English reading and writing, three quarters of Gaelic-medium pupils had done so. Figure 1 presents the English-reading attainment of Gaelic-medium and English-medium pupils from the same schools and shows the percentage of children reaching the curricular level that is expected of them at each stage.

Bha e an uair sin tarraingeach do phàrantan eile a dh’ol an lùib phàrantan mar sin. B’ i leantaileachd an t-adhbhar eile (bho ro-sgoil gu bun-sgoil no bun-sgoil gu òrd-sgoil); aon uair ’s gu robh sgoillean anns an t-siostarn mheadhain-Ghàidhlig, bha cuid de phàrantan na shaolaisinn nàdarr gum fuiricheadh iad ann agus bha daoine eile a’inneachadh na bhathas air ionnchasadh mar-thà a chaill.

A’ roghnachadh foghlam tro mheadhain na Beurla

Rinn an rannsachadh sgrùdadh cuideachd air carson a bhios daoine a’ roghnachadh an clann a chumail a-mach à foghlam tro mheadhan na Gàidhlig nuair a tha e ri fhàighinn. B’ e aon adhbhar nach b’ urrainn do phàrantan foghlam meadhain-Ghàidhlig a thaghadh ma ghluais iad à sgìre far nach robh foghlam tro mheadhan na Gàidhlig ri fhàighinn gu sgìre far a bheil, ach nuair a bha a’ chlann ro annoch airson nan amannan inintrigidh do dh’hfoghlam meadhain-Ghàidhlig (ire ro-sgoile no Priomh 1). B’ e adhbhar cumanta eile airson meadhain-Beurla a thaghadh gu robh egail air cuid de phàrantan nach biodh iad comasach an clann a chiudeachadh le obair-dhaichig ma bha i ann an cùanach nach robh iad a’ tuigsinn.

Bha cuid de phàrantan meadhain-Bheurla a’ cur taic ri ath-bheothachadh na Gàidhlig ach bha iad teagmhach an e foghlam an dòigh a b’ fheàrr a thoirt gu buil, agus air an adhbhar sin cha robh iad air foghlam tro mheadhan na Gàidhlig a roghnachadh don leanabh aca.

Toraidhean: Buileachadh

Buileachadh sa Bheurla aig sgoillean meadhain-Ghàidhlig agus sgoillean meadhain-Bheurla

Bhid sgoillean ann am foghlam tro mheadhan na Gàidhlig, nach eil a’ faighinn Beurla san t-seòmar-sgoile gu Priomh 3 co-dhù, a’ breith air agus a’ dol seachad air sgoillean meadhain-Bheurla ann an comasan sa Bheurla. Ro AS2, ged nach robh ach dàrna leth de na sgoillean meadhain-Bheurla air Ìre E, an Ìre iomchaideadh, a ruigheann ann an leughadh agus sgìobhadh na Beurla, bha tri choirtheadh dhe na sgoillean meadhain-Ghàidhlig aig an ìre seo. Tha Fiogar 1 a’ seàltainn buileachadh sgoillean meadhain-Ghàidhlig agus meadhain-Bheurla sna h-aon sgoiltean ann an leughadh na Beurla agus an ceudad de chloinn a ruigeas an ìre curraicealaim a thathas a’ sùileachadh dhaibh aig gach Ìre.
Figure 1: Attainment in English reading (percentage at or beyond level shown)

Source: Survey of Schools, 2009 (teacher judgements of pupil attainment)

Tús: Suirbhidh nan Sgoiltean, 2009 (breithneachadh thidsearan air buileachadh sgoilearan)

Figure 2 shows the proportion of Gaelic-medium and English-medium pupils attaining Level D or above in English literacy at the Primary 7 stage.

Figure 2: Attainment in English literacy (percentage at or beyond Level D in Primary 7)

Source: Scottish Survey of Achievement, 2007 (teacher judgements of pupil attainment)
Number of pupils: GM: 140, Matched EM: 149, All of EM: 7829.

Tús: Suirbhidh Albannach air Coileanadh, 2007 (breithneachadh thidsearan air buileachadh sgoilearan)
Gaelic-medium and English-medium pupils’ attainments in Science and Mathematics

In Science and Mathematics, the attainment of Gaelic-medium and English-medium pupils was broadly equal when Gaelic-medium pupils were compared with English-medium pupils of similar socio-economic status. For Science, this was the case whether attainment was analyzed by teacher judgement or by the results of tests administered by the Government as part of the Scottish Survey of Achievement 2007.

Thus Gaelic-medium pupils’ attainment in the other areas of the curriculum here studied does not seem to be affected by their learning subjects through the medium of Gaelic (typically their second language).

Buileachadh sgoilearan meadhain-Ghàidhlig agus meadhain-Bheurla ann an Saidheans agus Matamataig

Ann an Saidheans agus Matamataig, bha buileachadh sgoilearan meadhain-Ghàidhlig agus meadhain-Bheurla an ìre mhath co-ionnan nuair a chaidh sgoilearan meadhain-Ghàidhlig a shamhlaochad ri sgoilearan meadhain-Bheurla den aon inbhe shòisis-eacnamach. Ann an Saidheans b’ ann mar seo a bha a’ chùis ge bith an e tidsearan a rinn an anailis no an deach deuchain a dheanamh leis an Riaghaltas mar phàirt den t-Suirbhidh Albannach air Coileanadh, 2007.

Tha e coltach, ma-tha, nach eil buidhagh ionnsachadh tro mheadhan na Gàidhlig (mar as trice an dàrna cànan) air buileachadh sgoilearan a fhuair foghlaam meadhain-Ghàidhlig anns na pàirtean eile den churraicealam a chaidh a sgrùdadh an seò.

Fiogar 3: Buileachadh ann an Saidheans agus Matamataig: Prìomh 7 (ceudad aig no thairis air Ìre D ann am Prìomh 7) Figure 3: Attainment in science and mathematics: Primary 7 (percentage at or beyond Level D in Primary 7)

Source: Scottish Survey of Achievement, 2007 (teacher judgement of attainment)
Number of pupils: GM: 140, Matched EM: 149, All of EM: 7829.

Gaelic-medium pupils’ comparative attainments in Gaelic and English

Gaelic-medium pupils’ attainment in English had overtaken their attainment in Gaelic by the end of primary: 83% of Gaelic-medium pupils passed Level D Gaelic reading, compared with 93% achieving Level D English reading; the difference was similar for writing, as shown in Figure 4.

Tús: Suirbhidh Albannach air Coileanadh, 2007 (breithneachadh thidsearan air buileachadh sgoilearan)
Àireamh sgoilearan: MG 140, MB ionnan ri MG: 149, MB gu lèir: 7829.

Coimeas eadar buileachadh ann an Gàidhlig agus ann am Beurla aig sgoilearan meadhain-Ghàidhlig

Bha buileachadh sgoilearan meadhain-Ghàidhlig ann am Beurla air a dhol seachad air am buileachadh ann an Gàidhlig ro dheireadh na bun-sgoile: bha 83% de sgoilearan meadhain-Ghàidhlig air fhaighinn tro Ìre D ann an leughadh na Gàidhlig, an coimeas ri 93% a’ toirt Ìre D a-mach ann an leughadh na Beurla; bha an aon seòrsa eadar-dhealachaideigh ri fhaicinn ann an sgorbhadh, mar a chithear ann am Fiogar 4.
Gaelic-medium and English-medium pupils’ literacy attainment in their language of education

However, the attainment of Gaelic-medium pupils in Gaelic (whether reading or writing) is similar to the corresponding attainment of English-medium pupils in English at the Primary 5 and Primary 7 stages. This is true in relation to both ‘all-of-English-medium’ and the ‘matched English-medium’ pupil groups. Figure 5 shows the data for the Primary 7 stage.

Tús: Suirbhidh Albannach air Coileanadh, 2007 (breithneachadh thidsearan air buileachadh sgoilearan). Àireamh sgoilearan: 140

Buíeachadh sgoilearan meadhain-Ghàidhlig agus meadhain-Bheurla ann an litearrachd sa chànain sa bheil iad a’ faighinn foighlaim Ach, tha buileachadh sgoilearan meadhain-Ghàidhlig anns a’ Ghàidhlig (ge bith ann an leughadh no ann an sgriobhadh) coltach ris a’ bhuieachadh aig sgoilearan meadhain-Bheurla anns a’ Bheurla ann am Prìomh 5 agus Prìomh 7. Tha seo fior a thaobh ‘meadhain-Beurla gu lèir’ agus ‘meadhain-Beurla a tha ionnan ri meadhain-Gàidhlig’. Tha Fiogar 5 a’ sealltainn ann dàta airson Prìomh 7.

Source: Scottish Survey of Achievement, 2007 (teacher judgements of pupil attainment). Number of pupils: 140

Fiogar 4: Buileachadh cànain sgoilearan meadhain-Ghàidhlig (ceudad aig no thairis air Ìre D ann am Prìomh 7)

Figure 4: Gaelic-medium pupils’ language attainment (percentage at or beyond Level D in Primary 7)

Fiogar 5: Buileachadh litearrachd anns a’ phriomh chànain foighlaim (ceudad aig no thairis air Ìre D ann am Prìomh 7)

Figure 5: Literacy attainment in main language of education (percentage at or beyond Level D in Primary 7)
The results on choice and attainment are broadly consistent with previous research (Johnstone et al. 1999, MacNeil 1993, Stockdale et al. 2003). In relation to attainment, Gaelic-medium pupils acquire or develop an additional language without affecting their attainment in the other areas of the curriculum here investigated. People choose Gaelic-medium education because of this educational gain, and also because they value the language as part of their cultural identity.

References


Further information

The full research report may be obtained from Bòrd na Gàidhlig at:: www.gaidhlig.org.uk

The authors may be contacted at the University of Edinburgh:
Fiona O’Hanlon (Fiona.O’Hanlon@ed.ac.uk),
Wilson McLeod (W.McLeod@ed.ac.uk),
Lindsay Paterson (Lindsay.Paterson@ed.ac.uk).


Further information

The full research report may be obtained from Bòrd na Gàidhlig at:: www.gaidhlig.org.uk

The authors may be contacted at the University of Edinburgh:
Fiona O’Hanlon (Fiona.O’Hanlon@ed.ac.uk),
Wilson McLeod (W.McLeod@ed.ac.uk),
Lindsay Paterson (Lindsay.Paterson@ed.ac.uk).


