統計教育のベンチマーク（参照基準）

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ネイヴィル・デイヴィス
英国王立統計協会
統計教育センター
英国　プリマス大学

Royal Statistical Society Centre for Statistical Education

promotes improvement in statistical education

英国王立統計学会　統計教育センター

統計教育の改善を推進しています

For people of all ages –
primary and secondary schools, colleges, higher education, the workplace and the public

小、中、高等教育機関、職場の人々
- すべての年齢の人々のために

How the RSSCSE is funded
どのようにRSSCSEが創設されたか

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Centre for Statistical Education

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Welcome to the RSSCSE

IMP WITH PLYMOUTH UNIVERSITY

New Masters Qualification in Teaching at Pre-University Level in Mathematics and Statistics

The Royal Statistical Society Centre for Statistical Education (RSSCSE), **Plymouth University** (PU) and **Mathematics in Education and Industry** (MEI, www.mei.org.uk) have developed new Masters level degree pathways. They have just been validated by Plymouth University as part of its well-established International Masters Programme (IMP) and the first cohort of students will start 14 September 2013.

› READ MORE...

Quantitative Methods Initiative

The Quantitative Methods Initiative which is funded by the Economic and Social Research Council and Higher Education Academy have recently launched a new website that aims to improve capacity in quantitative social science and make best possible use of the UK's world-class data infrastructure.

The site covers the entire educational life course from school projects to postdoctoral research and all social science disciplines. It includes both research and teaching and learning.You can access the site here www.quantitativemethods.ac.uk.

In addition anyone interested in teaching materials for Quantitative Methods can access an archive held at the University of Oxford by the Department of Sociology, it is open for all to use but copyright of the materials remains with the authors. You can access the archive at www.sociology.ox.ac.uk.

WinAtSchool

Stage 2 opens on 4th February 2013

The Royal Statistical Society Centre for Statistical Education (based at Plymouth University) and Winton Capital Management are proud to announce the launch of an online statistics competition for Year 10 and 11 pupils in all UK secondary schools. The competition will be fun and easy to enter with prizes for winning schools.

To register your school and for further details visit www.winatschool.org.uk

ROYAL STATISTICAL SOCIETY
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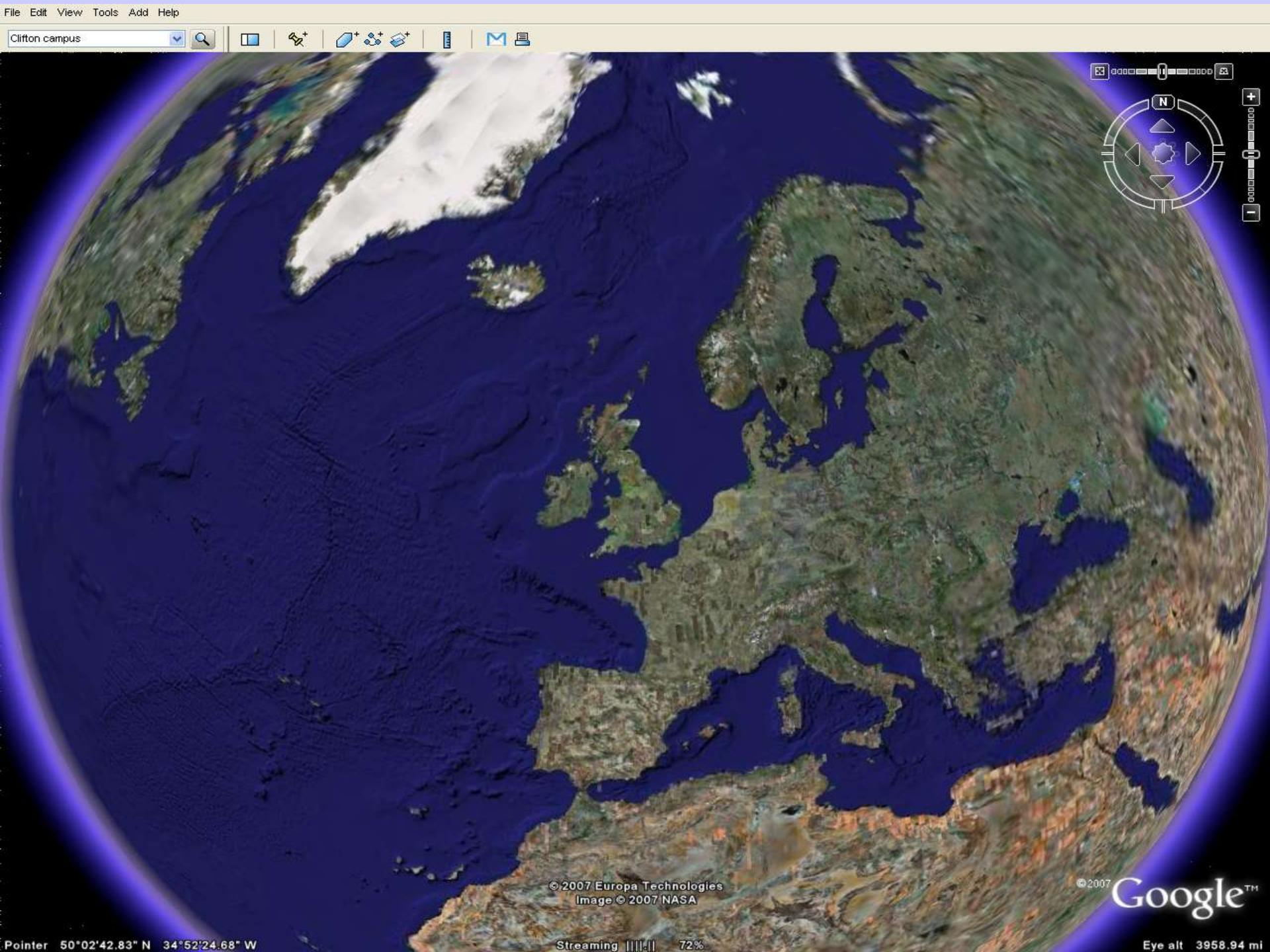
WJEC CBAC

Office for National Statistics
www.census.gov.uk
TEACHING STATISTICS TRUST
Minitab
QUALITY. ANALYSIS. RESULTS.
The Higher Education Academy
Maths, Stats & OR Network


File Edit View Tools Add Help
Clifton campus
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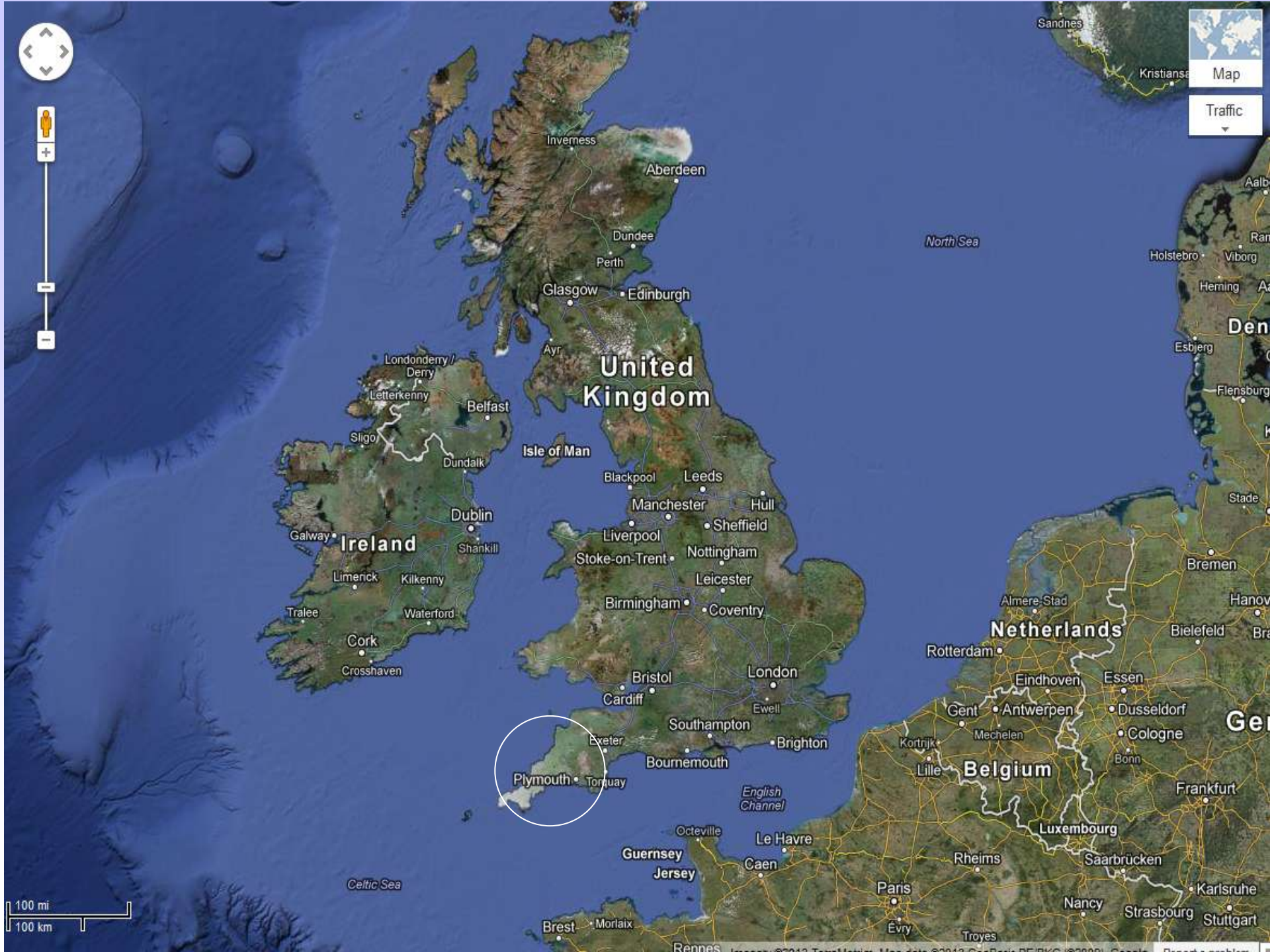
© 2007 Europa Technologies
Image © 2007 NASA
©2007 Google™
Pointer 50°02'42.83" N 34°52'24.68" W
Streaming 72%
Eye alt 3958.94 mi


Map
Traffic
Inverness
Aberdeen
Dundee
Perth
Glasgow
Edinburgh
Ayr
United Kingdom
North Sea
Londonderry / Derry
Letterkenny
Belfast
Sligo
Dundalk
Isle of Man
Blackpool
Leeds
Manchester
Hull
Sheffield
Dublin
Galway
Ireland
Liverpool
Shankill
Stoke-on-Trent
Nottingham
Limerick
Kilkenny
Leicester
Tralee
Waterford
Birmingham
Coventry
Cork
Crosshaven
Bristol
London
Cardiff
Ewell
Southampton
Exeter
Brighton
Bournemouth
Plymouth
Torquay
English Channel
Netherlands
Rotterdam
Eindhoven
Essen
Gent
Antwerpen
Dusseldorf
Mechelen
Cologne
Kortrijk
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Belgium
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Frankfurt
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Guernsey
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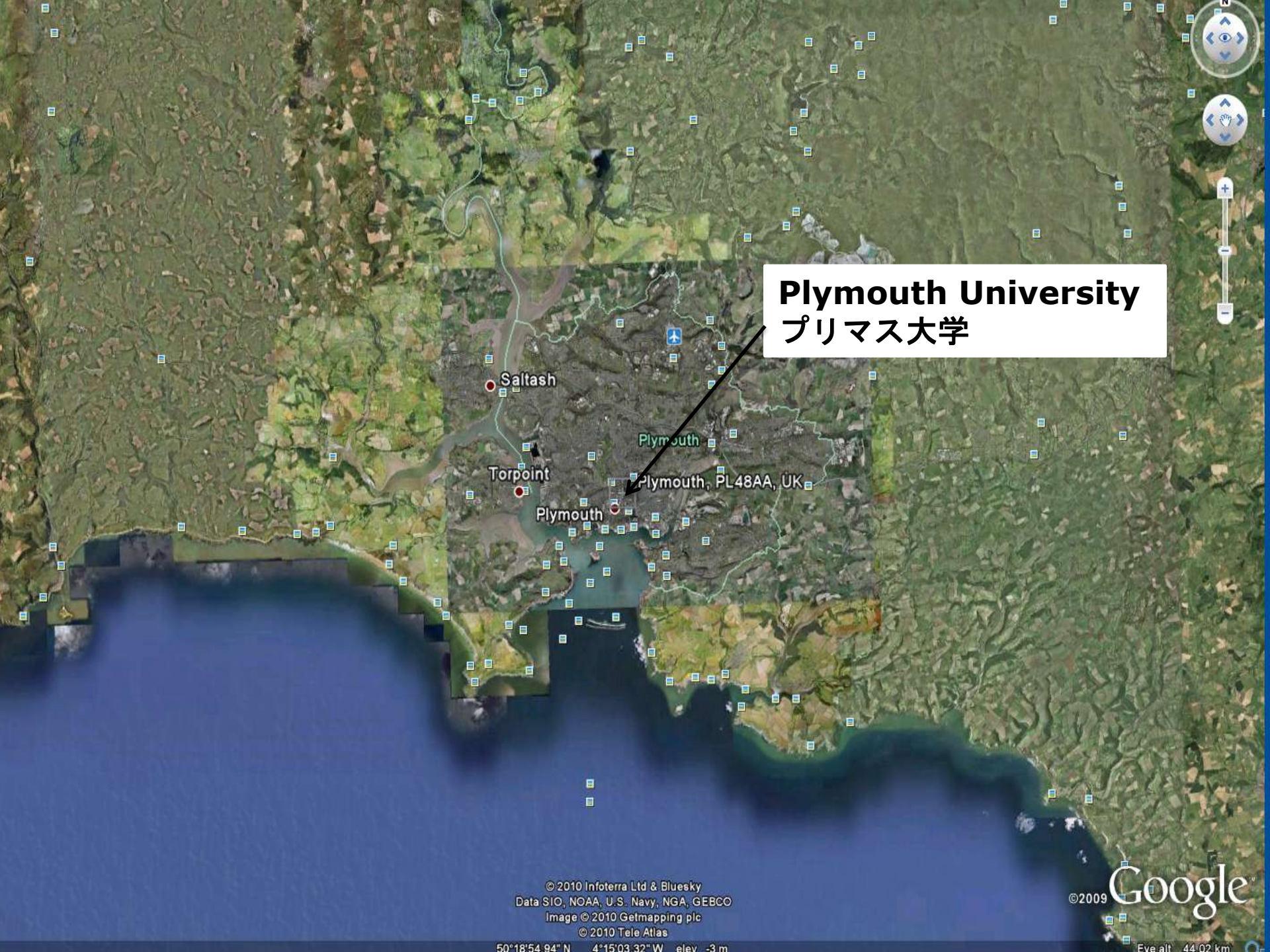
Caen
Rheims
Saarbrücken
Paris
Karlsruhe
Nancy
Strasbourg
Stuttgart
Celtic Sea
Brest
Morlaix
Évry
Troyes
Rennes
Bremen
Esbjerg
Holstebro
Viborg
Herning
Flensburg
Stade
Bielefeld
Almere-Stad
Sandnes
Kristiansa
100 mi
100 km

Plymouth - on the border between Devon and Cornwall
プリマスー　デーヴォンとコーンウォールの境に位置している


Plymouth University
プリマス大学
Saltash
Plymouth
Torpoint
Plymouth, PL48AA, UK
Plymouth
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Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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Univerity of Plymouth Panorama 2
By Stuart MacVeigh
Misplaced?
Inappropriate
Comment it
Panoramio
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Plymouth University
プリマス大学
University of Plymouth [wide]
By Stuart MacVeigh
Misplaced?
Inappropriate
Comment it
Panoramio
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Sponsored Links
University of Plymouth
Find out more about our postgraduate opportunites
www.plymouth.ac.uk/postgraduate
Student Storage Plymouth
Store for the summer for £96 Includes free boxes & collection!
www.plymouthselfstorage.co.uk
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©2010 Tele Atlas
Imagery Date: Apr 5, 2007
50°22'32.56" N 4°08'19.67" W elev 39 m
Eye alt 1.04 km

Local attractions - Plymouth harbour area
地元の観光場所 - プリマス港エリア

View of Plymouth Barbican, fro Capt'n Jaspers

By PaulRustyRuss
Misplaced?
Inappropriate
Comment it

Panoramio

Upload your photos »

Plymouth, the Sound

By qszech
Misplaced?
Inappropriate
Comment it

Panoramio

Upload your photos »

Sponsored Links

Vetted By Us Voted By You
Carpenters in Plymouth ready to quote for your project
www.gradethetrades.c

Student Storage Pl
Store for the summer
free boxes & collectio
www.plymouthselfstor

Plymouth. Barbican in the night. SG

By Sergey Grishin
Misplaced?
Inappropriate
Comment it

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Sponsored Links

Novotel - fr £59 per room
Novotel Plymouth - 3 star contemporary hotel. Book now
www.novotel.com

Invicta Hotel
Central Location, competative rates ring us or book on line now
www.invictahotel.co.uk

Imagery Date: Apr 5, 2007 50°21'57.90" N 4°08'01.77" W elev 3 m Eye alt 1.04 km

Statistical education is important for people of all ages
統計教育は全ての年代の人々にとって大切である

- DATA – we are awash with data　　データ – 私たちはデータであふれている
  - data are numbers in context: *context* is everything
    データとはコンテクスト(文脈)のある数字である：文脈が全て
  - it sets the subject apart from all others
    他の科目と異なり、文脈で目的が決まる

  Statistics: get trustworthy information from data
    統計学によって、データから信頼できる情報を得る
  - *context* makes the teaching and learning of statistics important
    文脈が、統計を学び教えることを重要にする
  - statistics helps us to understand the world around us
    統計学は身の回りの世界の理解を手助けする
- Right balance of mathematics　数学との適切なバランス
- (UK) university lecturers deliver statistics as part of mathematics
  （UK）大学教員は統計学を数学の一部として扱っている
- (UK) mathematics school teachers tend to　（UK）数学教師は以下の傾向がある
  - regard statistics as a bit of nuisance within mathematics
    統計学を、数学における厄介なものとみなしている
  - teach it as mathematics-driven, rather than data-driven
    データ主導ではなく、数学主導のものとして教える

Reflections on trying to improve statistical education
統計教育の改善への考察

- What statistics to teach? To whom?
  誰に、どのような統計学をおしえるのか？
- Who should learn statistics?
  誰が統計学を学ぶべきなのか？
- Who should teach statistics?
  誰が教えるべきなのか？
- How should statistics be taught?
  どのように教えられるべきなのか？
- Statistics knowledge and pedagogy?
  統計の知識と教育学は？
- Who needs statistics benchmarks?
  誰が統計教育の参照基準を必要とするのか？

Statistics Benchmarks?基準統計とは？

- **Teaching and learning statistics takes place in**
  primary school – secondary school – university – workplace
  統計学は、初等、中等、高等教育機関や職場で教育、学習される
- **Workplace uses knowledge from**
  - **university and secondary school**
    職場では大学や高等学校の知識が使用される

1) **Statistics benchmarks for school?　学校のための統計教育の基準とは？**
   - **Secondary school uses knowledge from primary school**
     中等教育では初等教育の知識が活かされる
2) **Statistics benchmarks for universities?　大学のための統計教育の基準とは？**
   - **what statistics should they teach?　どのような統計を教えるべきか？**
3) **Statistics benchmarks for the workplace?　職場での統計教育参照基準とは？**
   - **what do employers and employees need?**
     雇用主と従業員には何が必要か？
4) **Statistics benchmarks for the public?**
   一般の人々に向けた統計教育の基準とは？

Improving statistical education in four areas
四つの分野での統計教育の改善

1) Schools　学校
2) Universities　大学
3) Workplace　仕事場
4) Public　公衆

Statistics benchmarks for all areas?
全ての場所での統計教育の参照基準とは？

1) Statistics development in schools RSSCSE and RSS
学校での統計の発展　RSSCSE とRSS

a) RSSCSE *AtSchool* projects (2000 -)

RSSCSE アットスクールプロジェクト（2000-）

- CensusAtSchool; ExperimentsAtSchool; WinAtSchool; Stats2013AtSchool　(worldwide statistics quiz for Statistics2013)

センサスアットスクール、エクスペリメンツアットスクール、ウィンアットスクール、スタッツ2013アットスクール（統計学2013での世界統計クイズ）

b) RSSCSE review of statistics in the school maths curriculum (2005-2007)

RSSCSE　算数教育での統計の見直し　（2005-2007）

- 11 recommendations　11のアドバイス

c) RSS review of statistics in primary and lower secondary school (Porkess, 2012)　RSS　小学校、下級中学での統計の見直し　（ポーケス、2012）

d) RSSCSE Review of statistics in university mathematics teacher training (2010 – 2012)

RSSCSE 大学の数学教員トレーニングでの統計の見直し(2010 – 2012)

- 10 recommendations (extra slides at the end)
- 10のアドバイス（最後に別途スライド）

e) Review of changes in post-16 mathematics (2012 -)

ポスト１６数学での改変の見直し（2012−）

- Statistics across the A level curriculum (Porkess, 2012 -)

Aレベルの全体での統計教育　（ポーケス、2012-）

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2) Statistics quality assurance in universities RSSCSE
2)大学での統計学の質保証　RSSCSE

a) **Visits to four UK university departments to review Maths, Stats and OR undergraduate provision (1996 – 1998)**
数学、統計、ORの学部規定を見直すため、四つのイギリス大学を訪問(1996-1998)

b) **Member of the working party that derived for the Quality Assurance Agency (QAA) the first Maths, Stats and OR benchmark statement (2001 – 2002 – 2007)**
質保証機構(QAA)のメンバーは最初に数学、統計、ORのベンチマークステートメントから生成された(2001 – 2002 – 2007)

c) **Assessed and accredited the provision of the undergraduate programme in Statistics & OR in the Department of Statistics and Operations Research at Kuwait University (2005 – 2011)**
クウェート大学の統計回オペレーションズリサーチ学部で、統計学回ORの学部プログラム規定が査定され、正式認可された(2005 – 2011)

d) **Assessed and accredited the provision of the undergraduate programme in Statistics at the Department of Physics and Mathematics at Qatar University (2008 – 2011)**
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3) Statistics workplace links with university RSSCSE
統計学の職場は大学とリンクしている　RSSCSE

a) Statistical awareness curriculum for Science, Technology, Engineering and Mathematics (STEM) graduate employees (2011 – 2012)

科学、技術、工学、数学（STEM）を卒業した従業者への統計認識カリキュラム

a) Bringing industrial problems into the workplace (2011 – 2012)

産業問題を職場に持ち込む

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産業問題を職場に持ち込む

4) 10-year statistical literacy campaign
RSS public outreach - *getstats*
４)統計能力向上１０年計画
RSS　公共活動　- *getstats*

a) Media　メディア
b) Elected representatives　選ばれた代表者
c) Education　教育
d) Employers　雇用主
e) General public　一般の人々

4) 10-year statistical literacy campaign
RSS public outreach - *getstats*
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RSS　公共活動　- *getstats*

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Improving statistical education in four areas
4つの分野における統計教育を改善する

1) **Schools　学校**

   1a) *CensusAtSchool* and *AtSchool* projects
   センサスアットスクール、アットスクールプロジェクト

   1d) Review of university maths training
   大学数学教育の見直し

2) **Universities　大学**

3) **Workplace　職場**

4) **Public　公衆**

Statistics benchmarks for all areas?
全ての場所での統計教育の参照基準とは？

1a) *AtSchool* Projects
1a) アットスクールプロジェクト

- CensusAtSchool encourages children to enjoy statistics

  センサスアットスクールは子供たちに統計を楽しむよう奨励している

- NZ implementation of *CensusAtSchool* has helped to trigger their new curriculum

  ニュージーランドでのセンサスアットスクールの導入は、新たなカリキュラムを生み出す引き金になった

1a) New Zealand Schools Mathematics and Statistics Curriculum
1a)ニュージーランドの学校での数学と統計カリキュラム

- **(UK) Nuffield Report (2013)　(UK)ヌーフィールドのレポート(2013)**
  - **International Comparisons and Lessons in post-16 mathematics**
  - **ポスト16数学での国際比較と授業**
  - **New Zealand post-16 mathematics take up amongst the best in those countries studied**
  - **ポスト16数学を学んでいる国の中で、ニュージーランドが１番になった**
  - **Key was their approach to teaching mathematics *and* statistics**
  - **数学*と*統計を教えたことが鍵となった**
- **Each of 8 levels defined by learning outcomes (solve problems) in three topics**

  3つのトピックの中で、8レベルの学習成果(問題解決)に分けられている
  - **Statistical investigation　統計による検討**
  - **Statistical literacy　統計リテラシー**
  - **Probability　確率**
- **Is NZ close to a set of school benchmark standards?**

  ニュージーランドは学校の標準的なベンチマークに近いのか？
- ***(Extra slides at the end of the presentation)***

  プレゼンテーションの最後に別途スライド有り

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TEACHING STATISTICS TRUST

1d) Trainee Mathematics Teacher and Teaching Statistics in British Secondary Schools

1d）数学教師研修員とイギリス中学校の統計教育

RSSCSE Research Report

September 2012

RSSCSE調査レポート

2012　9月

getstats ROYAL STATISTICAL SOCIETY

Meeting Sponsored by RSS Education Strategy Group and RSS General Applications Section

1d) Summary of Research Findings
1d)　調査結果の要約

- **Statistics is a bit of a nuisance in the mathematics curriculum at school**
- **統計は学校数学カリキュラムでの厄介者になっている**

- **Non-specialists can perpetuate a cycle of indifference to and dislike for statistics from school to university and back into school**
- **非専門家は、統計への無関心と毛嫌いのサイクルがずっと続いていく可能性がある**

- ***Data makes statistics enjoyable to students***
- *データが生徒にとって統計を楽しいものにしている*

- ***Statistics is a vital tool for critically understanding the world (including society) around us***
- *統計は身の回りの世界を（社会を含めて）批評的に理解するのに不可欠なツールである*
- ***(Extra slides giving more details of the findings at the end of the presentation)***
- *(プレゼンテーションの最後に別途さらに詳細が書かれたスライド有り)*

Improving statistical education in four areas
4つの分野における統計教育を改善する

1) **Schools　学校**
2) **Universities　大学**
   2b) Quality Assurance Agency benchmarks
   英国質保証機構の基準基準
3) **Workplace　職場**
4) **Public　公衆**

Statistics benchmarks for all areas?
全ての場所での統計教育の参照基準とは？

2b) UK Quality Assurance Agency work (HE level….)
2b) イギリス質保証機構の仕事（高等教育 レベル…）

The Quality Code

The UK Quality Code for Higher Education

The UK Quality Code for Higher Education (the **Quality Code**) sets out the **Expectations** that all providers of UK higher education are required to meet.

We work closely with the UK higher education sector to develop, maintain and update the Quality Code. Higher education providers apply it in designing and delivering programmes of study. Our reviewers use it as the main reference point for their review work.

The Quality Code

Part A: Setting and maintaining threshold academic standards

Part B: Assuring and enhancing academic quality

Part C: Information about higher education provision

How the Quality Code is used

The Quality Code replaces the set of national reference points known as the Academic Infrastructure, from the 2012-13 academic year. The Quality Code gives all higher education providers a shared starting point for setting, describing and assuring the academic standards of their higher education awards and programmes and the quality of the learning opportunities they provide. Providers use it to design their respective policies for maintaining academic standards and quality.

What the Quality Code covers

The Quality Code has three **Parts**, on academic standards, academic quality and information about higher education provision. Each of these is subdivided into **Chapters** covering specific themes. (See box above right.)

Further information

Read our brief guide to gain an overview of the Quality Code - its key features, why it's important, and how it's used.
Read the General Introduction to the Quality Code which supports all the other Chapters.
Find out about how the Quality Code is being developed and the protocols for revising it.
QAA Enterprises offers training and consultancy services to help you explore the Quality Code further.

Back to the top.

The UK Quality Code for Higher Education:
A brief guide

高等教育のための UK品質コード：概要

The UK Quality Code for Higher Education (the Quality Code) is used to assure the standards and quality of higher education in the United Kingdom. It is developed and maintained by the Quality Assurance Agency for Higher Education (QAA) through consultation with the higher education sector and is used by individual higher education providers to ensure students have the high-quality educational experience they are entitled to expect. It consists of a series of separate Chapters grouped in three Parts and published online at **www.qaa.ac.uk/assuringstandardsandquality/quality-code.**

How do we define standards and quality?

Threshold **academic standards** are the minimum level of achievement that you have to reach to succeed on your course and achieve the qualification. A key feature of this is that threshold standards should not vary from one higher education provider to another.

Academic quality is how well your higher education provider supports you in your learning: the teaching, the support available, how you are assessed, and the resources available.

Quality assurance is the process for checking that the standards and quality of higher education provision meet agreed expectations.

2b) UK Quality Code
UK品質コード

- **The UK Quality Code for Higher Education assures the standards and quality of higher education**
- **高等教育のためのUK品質コードは高等教育での基準と品質を保証するものである**
- **Developed and maintained by the Quality Assurance Agency for Higher Education (QAA)**
- **高等教育質保証機構により発展、維持されていく**
- **Used by UK universities to ensure students have the high-quality teaching and learning experience *they are entitled to expect***
- **英国内の大学で、*学生が質の高い*教育と学習を経験したことを保証するために使われる**

- **Three chapters published online at**
- **3つの憲章がホームページで公表されています**

www.qaa.ac.uk/assuringstandardsandquality/quality-code

2b) What it does *not* cover
2b)保証*しない*もの

- The Quality Code relates to the **learning and teaching** activities of a higher education provider

  品質コードは高等教育者における教員の学習、教育活動に関連する

- It does **not cover staff research**

  教員以外のスタッフによる研究は含まれていない

  - other than the provision of research degree programmes

    リサーチ・ディグリー・プログラムの規定以外

QAA – subjects　QAA –科目

Subject guidance
Honours degree subjects
Master's degree subjects
Health professions
Scottish benchmark statements
Statements in development

Honours degree subjects　優等学位の分野

Subject benchmark statements explaining the core competencies at honours degree level

Subject benchmark statements for bachelor's degrees with honours are available in the following subjects.
See also the benchmark statements for qualifying awards for professions in Scotland.

Accounting (2007)
Agriculture, horticulture, forestry, food and consumer sciences (2009) ; note 1
Anthropology (2007)
Archaeology (2007)
Architectural technology (2007)
Architecture (2010)
Area studies (2008)
Art and design (2008) ; note 2
Biomedical science (2007)
Biosciences (2007)
Construction, property and surveying (2008) ; note 3
Chemistry (2007)
Classics and ancient history (including Byzantine Studies and Modern Greek) (2007)
Communication, media, film and cultural studies (2008)
Computing (2007)
Counselling and psychotherapy (2013)
Criminology (2007)
Dance, drama and performance (2007)
Dentistry (2002)
Early childhood studies (2007)
Earth sciences, environmental sciences and environmental studies (2007)
Economics (2007)
Education studies (2007)
Engineering (2010) ; note 4
English (2007)
Finance (2007)

Finance (2007)
Forensic science (2012)
General business and management (2007)
Geography (2007)
Health studies (2008)
History (2007)
History of art, architecture and design 2008 ; note 2
Hospitality, leisure, sport and tourism (2008)
Housing studies (2007)
Landscape architecture (2007)
Languages and related studies (2007)
Law (2007)
Librarianship and information management (2007)
Linguistics (2007)
Materials (2008)
Mathematics, statistics and operational research (2007)
Annex to Mathematics, statistics and operational research to cover integrated master's degrees (2009)
Medicine (2002)
Music (2008)
Optometry (2007)
Osteopathy (2007)
Philosophy (2007)
Physics, astronomy and astrophysics (2008)
Politics and international relations (2007)
Psychology (2010) ; note 5
Social policy and administration (2007) ; note 6
Social work (2008) ; note 6
Sociology (2007)
Theology and religious studies (2007)
Town and country planning (2008)
Veterinary science (2002)
Welsh (2008) / Cymraeg (2008)
Youth and community work (2009)

Mathematics Statistics and OR
数学、統計、OR

1 Following a review, the revised statement for Agriculture, forestry, agricultural sciences, food sciences and consumer sciences has been published under the title of Agriculture, horticulture, forestry, food and consumer sciences

2b) QAA – MSOR Benchmark Content
2b) QAA – MSOR ベンチマークの内容

- Introduction　はじめに
- Nature and extent of Mathematics, Statistics and OR
- 数学、統計、ORの特性と範囲
- Knowledge, understanding and skills
- 知識、理解と技能
- Teaching, learning and assessment
- 教育、学習、評価
- Benchmark standards
- ベンチマーク

2b) I Introduction　I はじめに

- **Background to types of courses　コース別背景**
  - Mathematics　数学
  - Statistics　統計学
  - Operational Research　オペレーションズ・リサーチ
- **Relationships　関係**
  - Within MSOR　MSORの中
  - With other disciplines　他の分野と
- **Career opportunities　職業の機会**
  - Learners who graduate from programmes in MSOR have an extremely wide choice of career available to them

  MSORの卒業生はきわめて広い職業選択の幅がある

2b) II Nature and extent of Mathematics, Statistics and OR
II 数学、統計およびオペレーショナルリサーチの特性と程度

- **Cumulative nature of MSOR　MSORの累積的性質**
  - Uses previously learned material
    前段階で学んだ素材を用いる
- **Different entry standards　異なるエントリー標準**
  - Student / mature learners　学生/　成人学習者
- **Time to assimilate　学習にかかる時間**
- **Nature of MSOR programmes　MSORプログラムの特性**

2b) III Knowledge, understanding and skills
III　知識、理解、技能

- **Subject-specific knowledge and understanding**

学科目の専門知識と理解

2b) III Subject specific knowledge and skills – mathematics
III学科目の専門知識と理解　–　数学

- **Theory-based　理論ベース**
  - Algebra, analysis, geometry, number theory, differential equations, proof, continuum mechanics, mathematical physics, probability theory, statistical mathematics
    代数、解析、幾何、整数論、微分方程式、証明、連続体力学、数理物理学、確率論、統計数学
- **Practice based　実践ベース**
  - Numerical mathematics and mathematical computing designed to support understanding of models, how they can be applied and problem solving rather than mathematical derivations and proofs
    数値解析と、モデルの理解をサポートするためにデザインされた数学的演算、それが数学的導出と証明のかわりに、どのように問題解決に応用されるのか

- ***Mixture of theory and practice***
  理論と実践のミックス

2b) III Subject specific knowledge and skills – statistics
III学科目の専門知識と技能　–　統計

- **Mixture of theory and practice　理論と実践のミックス**
  - Science of data investigations; formulating probability based models; making inferences from samples; statistical theory; applications of statistics in other areas; communicating statistics; data visualisation; likelihood; linear and non-linear statistical modelling; experimental design; stochastic processes; time series; Bayesian methods; statistical computing; specialist statistics packages
  - データ研究の科学；確率的なモデルの定式化；標本からの推測；統計理論；統計の他分野への応用；統計によるコミュニケーション；データの視覚化；尤度；線形と非線形の統計モデル；実験計画、確率過程；時系列；ベイズ法；統計計算；統計専門家パッケージ
- **Applications of statistics in other subjects　統計の他分野への応用**
  - biology, chemistry, medicine, pharmaceuticals, engineering, geography, archaeology, environmental science, actuarial science, economics, management, law and others.
  - 生物学、化学、医学，薬学、工学、地学、考古学、環境科学、保険数理、経済、経営、法律、その他
  - separate modules in these areas might also be available
  - これらの分野には、個別のモジュールが有効かもしれない。
  - such modules would often be taught by the respective subject departments.
  - それらのモジュールは、各分野の学科でよく教えられているだろう。

2b) III Subject specific knowledge and skills – statistics
III学科目の専門知識と技能　–　統計

- **Mixture of theory and practice　理論と実践のミックス**
  - Science of data investigations; formulating probability based models; making inferences from samples; statistical theory; applications of statistics in other areas; communicating statistics; data visualisation; likelihood; linear and non-linear statistical modelling; experimental design; stochastic processes; time series; Bayesian methods; statistical computing; specialist statistics packages
  - データ研究の科学；確率的なモデルの定式化；標本からの推測；統計理論；統計の他分野への応用；統計によるコミュニケーション；データの視覚化；尤度；線形と非線形の統計モデル；実験計画、確率過程；時系列；ベイズ法；統計計算；統計専門家パッケージ
- **Applications of statistics in other subjects　統計の他分野への応用**
  - biology, chemistry, medicine, pharmaceuticals, engineering, geography, archaeology, environmental science, actuarial science, economics, management, law and others.
  - 生物学、化学、医学，薬学、工学、地学、考古学、環境科学、保険数理、経済、経営、法律、その他
  - separate modules in these areas might also be available
  - これらの分野には、個別のモジュールが有効かもしれない。
  - such modules would often be taught by the respective subject departments.
  - それらのモジュールは、各分野の学科でよく教えられているだろう。

2b) IV Teaching, learning and assessment
教育、学習と評価

- **Face to face and/or distance learning**
- **対面、または遠距離学習**
- **Range of different methods for teaching**
- **異なる教育方法の範囲**
- **Learners take responsibility for their learning**
- **学習者は各々の学習に責任感を持つ**
- **Use of electronic teaching, learning and assessment**
- **電子教育、電子学習と電子評価**
- **Extended investigations or projects**
- **広範な検討、またはプロジェクト**

2b) V Benchmark standards
v　ベンチマーク基準

- **Introduction　はじめに**
  - Generalities only
  - 一般論のみ
  - Threshold and typical
  - 閾値と典型
  - Distinction is by depth; breadth; complexity of problems; ability to construct reasoned argument; facility to perform calculations or manipulations
  - 優秀性の決定は、深さ、幅、問題の複雑さ、理路整然とした議論を組み立てる能力、計算と操作が行える設備
  - Marks span the full range, unlike some other subjects
  - 他の科目と違って、成績が広範に付けられる
  - Large variation in marks between topics
  - トピックによって成績は大きく変動する

2b) 5 Benchmark standards Threshold
5　ベンチマーク基準のしきい値

- demonstrate a reasonable understanding of the basic body of knowledge for the programme of study
  学習プログラムの基本知識への適正な理解を示す
- demonstrate a reasonable level of skill in calculation and manipulation within this basic body of knowledge
  この基本知識で、適正レベルの計算と操作スキルを示す
- apply core concepts and principles in well-defined contexts, showing judgement in the selection and application of tools and techniques
  明確な文脈に核となる概念と原理を適用し、なぜその道具と手法を選択し適用したのか、理由を示す
- understand logical arguments, identifying the assumptions and conclusions made
  仮定と結論を識別しながら、論理的議論を理解する
- demonstrate a reasonable level of skill in comprehending problems, formulating them mathematically and obtaining solutions by appropriate methods
  問題を理解し、数学的に定式化し，適切な方法によって解答を得る，相当な水準の技能を示す
- present straightforward arguments and conclusions reasonably accurately and clearly
  単純明解な議論と討論をある程度性格かつ明確に提示する
- demonstrate appropriate general skills
  しかるべき総合的技能を示す
- demonstrate the ability to work professionally under guidance, seeking assistance when needed.
  必要な時には助力を求めながら、指導のもと専門化としての仕事をする能力を

2b) 5 Benchmark standards Typical
5　ベンチマーク基準の典型

- demonstrate a reasonable understanding of the main body of knowledge for the programme of study
  学習プログラムの主たる知識への適正な理解を示しなさい
- demonstrate a good level of skill in calculation and manipulation of the material within this body of knowledge
  この基本知識で、高いレベルの計算と操作スキルを明示しなさい
- apply a range of concepts and principles in loosely-defined contexts, showing effective judgement in the selection and application of tools and techniques
  大まかに定義された文脈に、幅のある概念と原理を適用し、それに有効な道具と手法の選択と適用法を示す
- develop and evaluate logical arguments
  論理的議論を発展させ、評価する
- demonstrate skill in abstracting the essentials of problems, formulating them mathematically and obtaining solutions by appropriate methods
  問題の根本を抽象化するスキルを示し、数学的に定式化し，適切な方法によって解答を得る
- present arguments and conclusions effectively and accurately
  効果的で正確に議論と結論を提示する
- demonstrate appropriate general skills
  しかるべき総合的技能を示す
- demonstrate the ability to work professionally with a degree of independence, seeking assistance when needed.
  必要な時には助力を求めながら、ある程度自立して専門家としての仕事をする能力を示す

Improving statistical education in four areas
4つの分野における統計教育を改善する

1) **Schools　学校**
2) **Universities　大学**
3) **Workplace　職場**
   - 3a) Statistics curriculum for STEM employees
     STEM従業員への統計カリキュラム
   - 3b) Industrial problems into university
     産業問題を大学内へ
4) **Public　公衆**

Statistics benchmarks for all areas?
全ての場所での統計教育の基準とは？

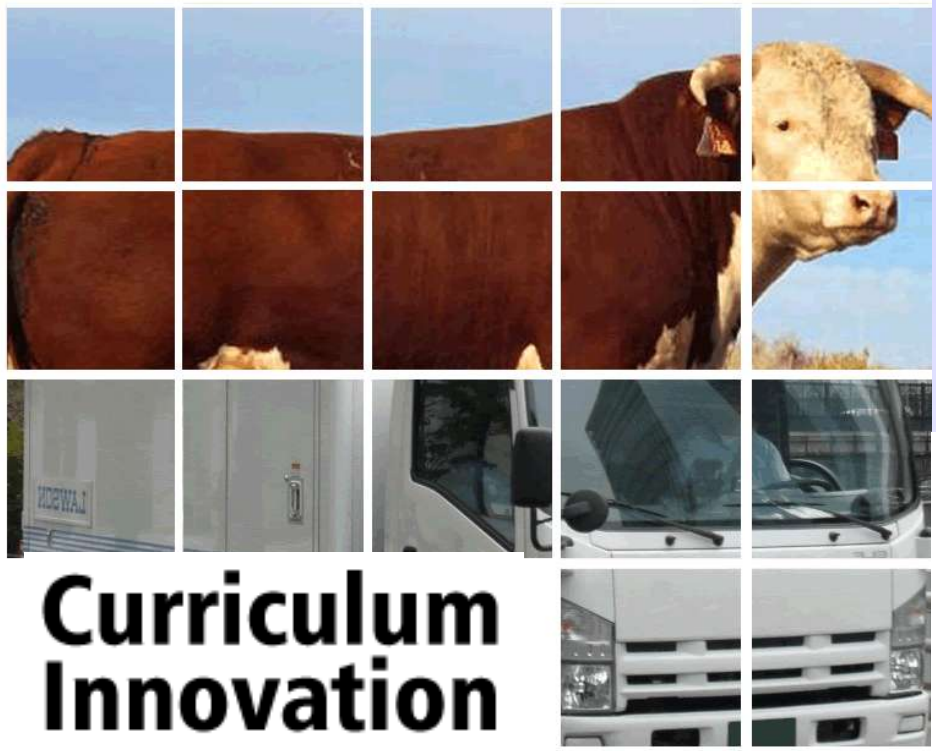
3a) A Statistical Awareness Curriculum for STEM Graduate Employees
STEM卒業就職者への統計認識カリキュラム

3a) A Statistical Awareness Curriculum for STEM graduate employees
STEMを卒業した従業者への統計認識カリキュラム

Objectives 目的

- Create a curriculum comprising what stem graduate employees should:
  STEMを卒業した従業者が必要なカリキュラムの作成
  - know and be able to do; 知識とできなければいけないこと
  - be able to critically discuss; 批評的に議論できなくてはいけない
  - know about. 知っていなければいけないこと
- Create an online statistical skills audit tool for STEM graduate employees
  STEMを卒業した従業者用のオンライン統計スキル監査ツールを作る
- Produce an exemplar online resource of a topic from within the curriculum spec
  カリキュラムに関したトピックの、オンライン資料見本を作る
- At ここにある www.rsscse-edu.org.uk/
  (see extra slides 別途スライドを見て下さい)

3b) Industrial Problems for the HE Curriculum
HEカリキュラムのための産業問題



カリキュラムの革新

問題解決

Data from a large UK food manufacturer
イギリスの大手食品製造業者からのデータ

3b) Industrial problems for the HE Curriculum
HEカリキュラムのための産業問題

Objectives 目的

- Work with an employer to 雇用主と取り組む目的
  - Identify real problem scenarios faced by the employer at three HE curriculum levels
  - 3つのHEカリキュラムレベルで、雇用主が対面している本当の問題状況を特定する
- Obtain real industrial data for each scenario
  それぞれのシナリオに対して実際の産業データ得る
- For each level 1 and 2 problems 各レベル1、2の問題について
  - Generate 1000 different problem realisations using real industrial data
  - 実際の産業データを使って1000個の問題を生成する
  - Generate corresponding solutions for tutors
  - チューターのためにそれぞれの解答を作成する
- Develop an online delivery system for the individualised problems, the data and their solutions
  個々の問題とデータ、解答を オンラインで配信するシステムを開発する

Improving statistical education in four areas
4つの分野における統計教育を改善する

1) **Schools　学校**
2) **Universities　大学**
3) **Workplace　職場**
4) **Public　公衆**

4e) getstats - statistics knowledge of public
ゲットスタッツ　-　一般のための統計知識

Statistics benchmarks for all areas?
全ての場所での統計教育の基準とは？

4e) What *do* UK people know/say about statistics?

英国の人々は統計を
どのように知り・語っているか？

(link here to the video)

4e) What *do* UK people know/say about statistics?
英国の人々は統計をどのように知り・語っているか？

4e) What would Japanese people know/say about statistics?
日本では統計がどのように知り・語られるだろうか？

4e) RSS 10-year statistical literacy campaign *getstats*
RSS 統計能力向上１０年計画　ゲットスタッツ

- **Launched in 2010**
- **2010年発足**
- **Aims to help build a society in which lives and choices are enriched by an understanding of statistics**
- **統計を理解することで、生活と選択が豊かな社会の構築を目指して**

4e) *Getstats* Campaign Activity Areas
ゲットスタッツ計画　活動範囲

Mediaメディア

Elected reps　議員

Education　教育

Employers　事業主

ROYAL STATISTICAL SOCIETY

General Public　一般の人々

Specialist resources
専門家の知識

- Journalists
- Elected representatives
- Teachers, lecturers and students　教師、講演者、生徒
- Employers and employees
- General Public

4e) getstats　Ten years to Statistical Literacy?
ゲットスタッツ　統計リテラシーまでの１０年とは？

1. A citizen's charter for statistics?
   統計の市民憲章？
   - *the minimum every citizen should know?*
     市民が最低限知っておかなければならないこと
2. Developing courses in statistical awareness
   統計認識に関するコースの開発
   - *for undergraduates and employees*
   - *学部生と会社員のために*
3. Teaching statistics in a more appealing way
   統計をもっと魅力的に教える
   - *using a problem solving approach*
   - *問題解決するような方法を使って*
4. Engagement with outside bodies
   他機関と関わる
   - *the BBC and more*
   - *BBC,その他*

4e) What *should* UK people know/say about statistics?
イギリスでは統計がどのように知り・語られるべきなのか？

Improving statistical education in four areas
4つの分野における統計教育を改善する

1) Schools　学校
2) Universities　大学
3) Workplace　職場
4) Public　公衆

Statistics benchmarks for all areas?
全ての場所での統計教育の基準とは？

Areas 1) – 4), how do we engage everyone with statistics?
分野1) – 4)，どのように人々を統計でつなげるのか？

- Do we need statistics benchmark standards and quality assurance at all levels of education and training?
  統計教育の基準と質保証は全ての水準の教育とトレーニングの場で必要か？
  - in schools　学校で
  - in universities　大学で
  - Workplace　職場で
  - public in general　一般公衆

- Urgent need to be more engaging about statistics
  統計をもっと魅力的にする差し迫った必要性
  - if necessary **change the way we teach**
  - もし必要なら**教育方法を変えよう**

- Statistics should not be an excuse for more mathematics
  統計を、さらに数学を導入する言い訳にはならない

Areas 1) – 4), *Statistics Charter*
Benchmark statistics
knowledge and skills for ...
分野1) – 4) 統計憲章、統計教育の基準、知識とスキル...

1) school leavers
   中退者
2) university specialist & non specialist graduates
   大学専門家と、非専門家卒業生
3) employers and employees
   雇用主と従業員
4) the general public
   一般公衆

Statistics Benchmark/Charter topics?
Minimum that everyone should
統計憲章、統計教育の基準のトピックスは？
皆が最低限知らなければいけないこと

1. know about　知るべきこと
2. identify or critically evaluate
   認識し、または厳しく評価すること
3. do or use　行い、使うこと

For discussion … a list of topics …
ディスカッションのため…トピックスのリスト…

(i) Know about
知るべきこと

1. Risk　リスク
2. Inference　推論
3. Probability for quantifying　数量化のための確率
4. Govt data and info　政府のデータと情報
5. Quality improvement　品質の改善
6. Examples of statisticians' work　統計学者の仕事の例
7. Strengths and weaknesses of indicators　指標の強みと弱み
8. Large data sets　大きなデータセット
9. Application areas　応用分野
10. Technical terms　専門用語

(ii) Identify or critically evaluate
特定し、または厳しく評価すること

1. Media accounts of an issue　あることがらのメディアの記事
2. Advertising　広告
3. Use in other subjects　他の分野での使用
4. Graphical representations　グラフを使用した表現
5. Risk assessment　リスク評価
6. Misuses of statistics　統計の誤用
7. Nature of sampling　サンプリングの本質
8. Anecdote and design　逸話と計画
9. Quality of questions in a questionnaire
   アンケートでの質問の質

(iii) Do or use
行い、使うこと

1. Target populations　目標母集団
2. Representative samples　代表標本
3. Probability as a measure of uncertainty
   不確実性の尺度としての確率
4. Randomness　無作為性
5. Variability　変動性
6. Evidence and inference for decision making
   意思決定のための証拠と推論
7. Reduction of bias in sampling　サンプリングにおける偏りの軽減
8. Reduction in bias in measuring　測定偏りの削減
9. Contexts　背景

The last slide　最後のスライド

1a) Extra slides about NZ curriculum
ニュージーランドのカリキュラムについての別途スライド

1a) NZ School Level 1
ニュージーランド、レベル１の学校

In a range of meaningful contexts, students will be engaged in thinking mathematically and statistically. They will solve problems and model situations that require them to:
背景に意味のある広範な分野で、学生は積極的に数学的、統計的に考える。彼らは問題を解決し尺度をモデル化するために以下のように行動する：

- Statistical Investigation　統計的な吟味
  - Conduct investigations using the statistical enquiry cycle:
  - 統計的な探索のサイクルを用いて吟味する：
    - posing and answering questions
    - 質問を提示し、回答する
    - gathering, sorting and counting, and displaying category data
      カテゴリデータを集め、分類、集計し、表示する
    - discussing the results　結果について議論する
- Statistical Literacy　統計リテラシー
  - Interpret statements made by others from statistical investigations and probability activities.
  - 他者が統計的な吟味と確率的な行動から作成した記述を解釈する
- Probability　確率
  - Investigate situations that involve elements of chance, acknowledging and anticipating possible outcomes.
  - 起こりうる結果を予想して確認し、確率的要素を状況を吟味する。

1a) NZ School Level 2
ニュージーランド、レベル２の学校

In a range of meaningful contexts, students will be engaged in thinking mathematically and statistically. They will solve problems and model situations that require them to:
背景に意味のある広範な分野で、学生は積極的に数学的、統計的に考える。彼らは問題を解決し尺度をモデル化するために以下のように行動する：

- Statistical Investigation　統計的な吟味
  - Conduct investigations using the statistical enquiry cycle:
  - 統計的な探索のサイクルを用いて吟味する：
    - posing and answering questions　質問を提示し、回答する
    - gathering, sorting, and displaying category and whole-number data
      カテゴリー及び整数データを集め、分類、集計し、表示する
    - communicating findings based on the data
      データから分かったことを伝える
- Statistical Literacy　統計リテラシー
  - Compare statements with the features of simple data displays from statistical investigations or probability activities undertaken by others
  - 他者が行った統計的な吟味と確率的な行動から導かれた、簡単なデータ表現を持つ記述を較べる
- Probability　確率
  - Investigate simple situations that involve elements of chance, recognising equal and different likelihoods and acknowledging uncertainty
  - 異なる尤度と等しい尤度を認識して不確実性を認めながら、確率的要素を持つ状況を吟味する。

1a) NZ School Level 8
ニュージーランド、レベル８の学校

In a range of meaningful contexts, students will be engaged in thinking mathematically and statistically. They will solve problems and model situations that require them to:

- Statistical Investigation
  - Carry out investigations of phenomena, using the statistical enquiry cycle:
    - conducting experiments using experimental design principles, conducting surveys, and using existing data sets
    - finding, using, and assessing appropriate models (including linear regression for bivariate data and additive models for time-series data), seeking explanations, and making predictions
    - using informed contextual knowledge, exploratory data analysis, and statistical inference
    - communicating findings and evaluating all stages of the cycle.

  - Make inferences from surveys and experiments:
    - determining estimates and confidence intervals for means, proportions, and differences, recognising the relevance of the central limit theorem
    - using methods such as resampling or randomisation to assess the strength of evidence

1a) NZ School Level 8
ニュージーランド、レベル８の学校

背景に意味のある広範な分野で、学生は積極的に数学的、統計的に考える。彼らは問題を解決し尺度をモデル化するために以下のように行動する：

- 統計調査
  - 統計的審問サイクルを使って現象の研究を遂行する：
    - 実験計画の原理を用いて実験を行い調査を実施し、既存のデータセットを用いる
    - 適当なモデル（２変量データの線形回帰と時系列データの加法モデルを含む）を見つけて適用し，結果を照合し，説明を探し，予測を行う
    - 情報に基づく背景知識を利用して探索的データ解析と統計的推測を行う
    - 分かったことを伝え、サイクルの全てのステージについて評価する

  - 調査や実験から推測する
    - 中心極限定理との関係を認識しながら、 平均、比率、差対して推定値と信頼区間を決定する
    - 再サンプリングやランダム化法を使って証拠の強さを評価する

1a) NZ School Level 8 (continued)
ニュージーランド、レベル８の学校（続き）

In a range of meaningful contexts, students will be engaged in thinking mathematically and statistically. They will solve problems and model situations that require them to:

- Statistical Literacy
  - Evaluate a wide range of statistically based reports, including surveys and polls, experiments, and observational studies:
    - critiquing causal-relationship claims
    - interpreting margins of error.
- Probability
  - Investigate situations that involve elements of chance:
    - calculating probabilities of independent, combined, and conditional events
    - calculating and interpreting expected values and standard deviations of discrete random variables applying distributions such as the Poisson, binomial, and normal

1a) NZ School Level 8 (continued)
ニュージーランド、レベル８の学校（続き）

背景に意味のある広範な分野で、学生は積極的に数学的、統計的に考える。彼らは問題を解決し尺度をモデル化するために以下のように行動する：

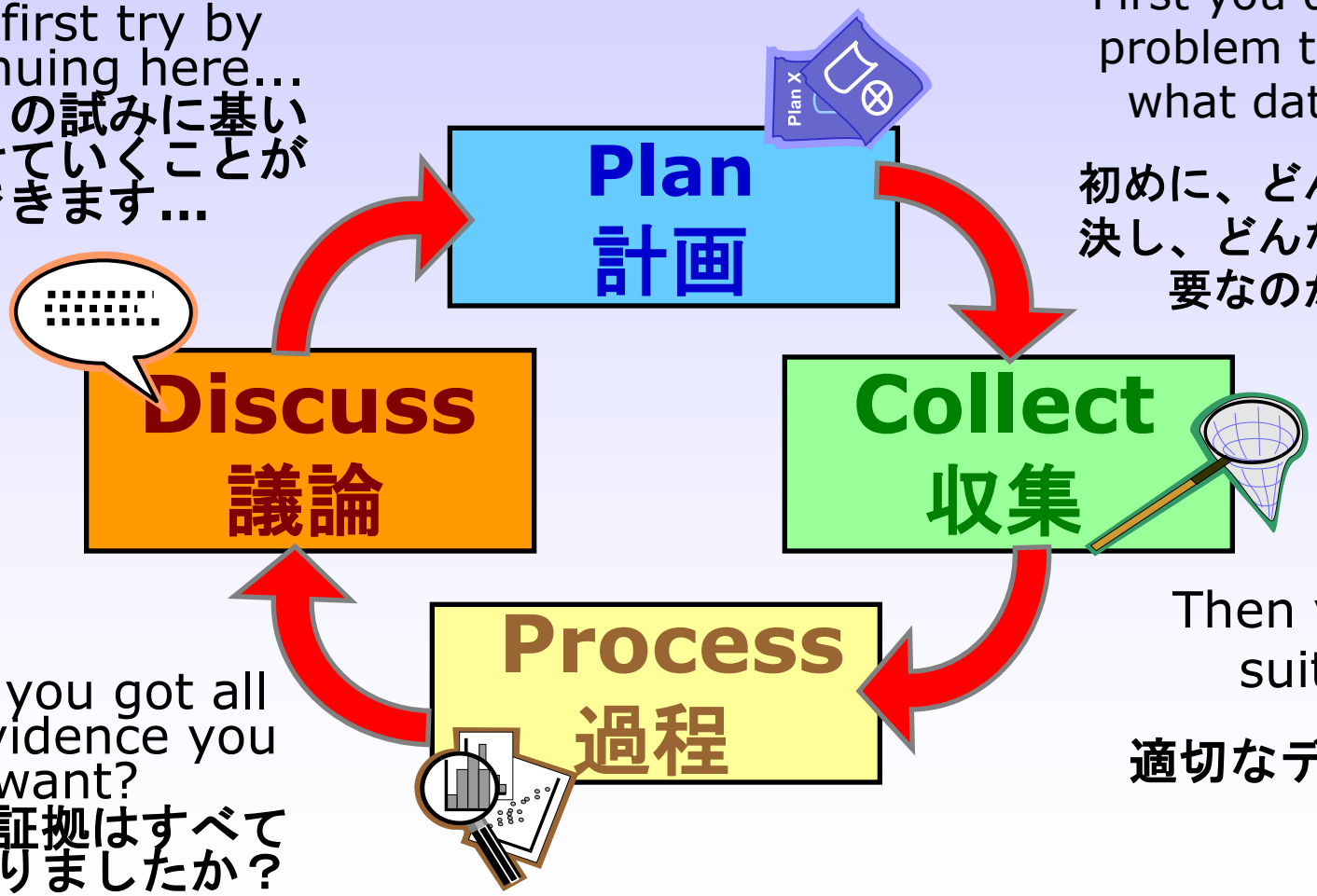
- 統計リテラシー
  - 統計調査、意識調査、実験や観察研究を含む広範な統計を用いたレポートを 評価する：
    - 因果関係の主張を論評する
    - 誤差の大きさを解釈する
- 確率
  - 確率的な要素を持つ状況を調査する：
    - 独立、結合、条件付きの事象の確率を計算する
    - ポアソン分布、２項分布、正規分布などの確率変数の期待値と標準偏差の計算と解釈

1) Extra slides on teaching through problem solving
問題解決につながる教育の追加スライド

Teaching Statistics through Problem Solving
問題解決につながる統計を教える

Plan　計画	Collect　収集	Process　過程	Discuss　議論

You can build on the first try by continuing here...
一回目の試みに基いて続けていくことができます...



First you decide what problem to solve and what data you need

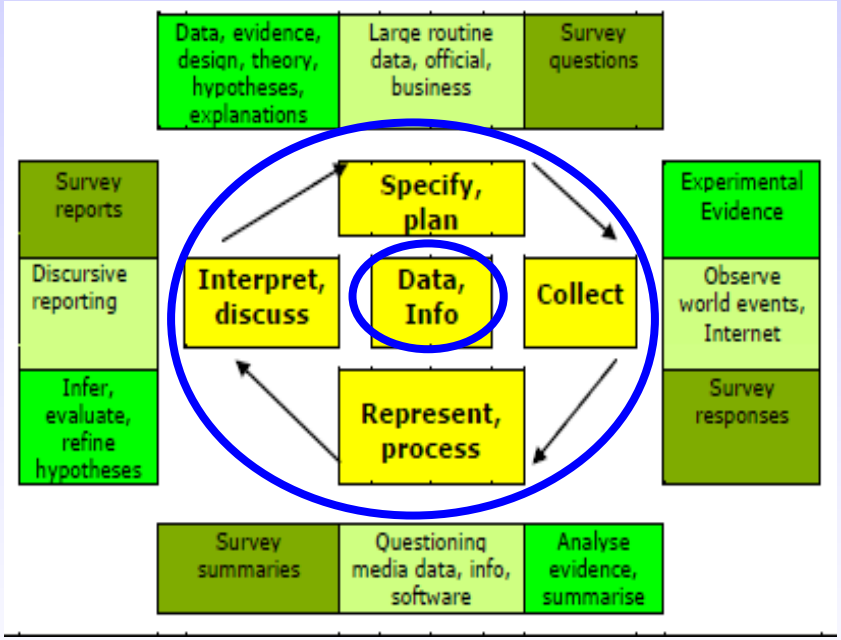
初めに、どんな問題を解決し、どんなデータが必要なのかを決めます

Then you collect suitable data.

適切なデータを集めます

Have you got all the evidence you want?
必要な証拠はすべて見つかりましたか？

図形１　退学者への統計認識
数字－データ－情報－収集－発表－分析－議論－報告－意思決定



図形１　退学者への統計認識
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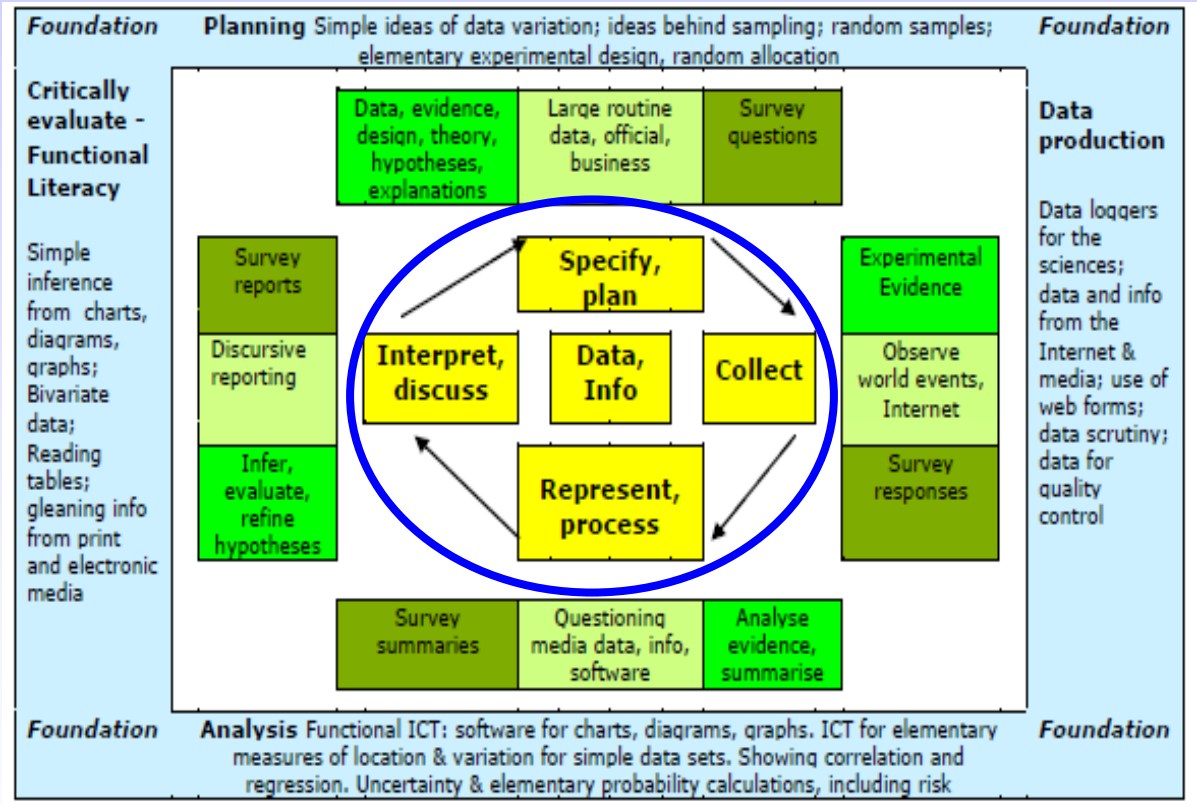
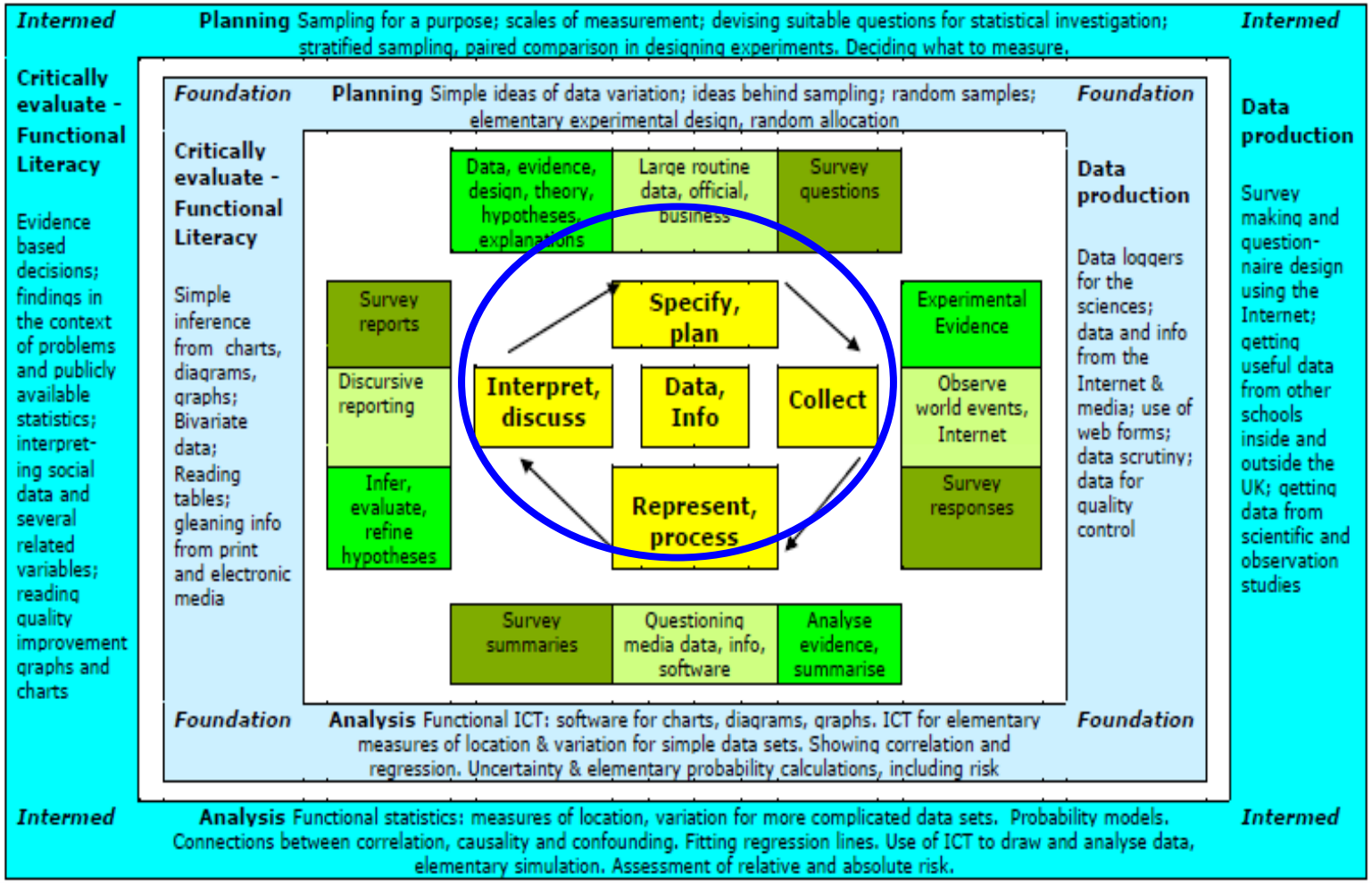


Diagram 1 Statistical Awareness for School leavers
Numbers-Data-Information-Collection-Presentation-Analysis-Discussion-Reporting-Decision Making

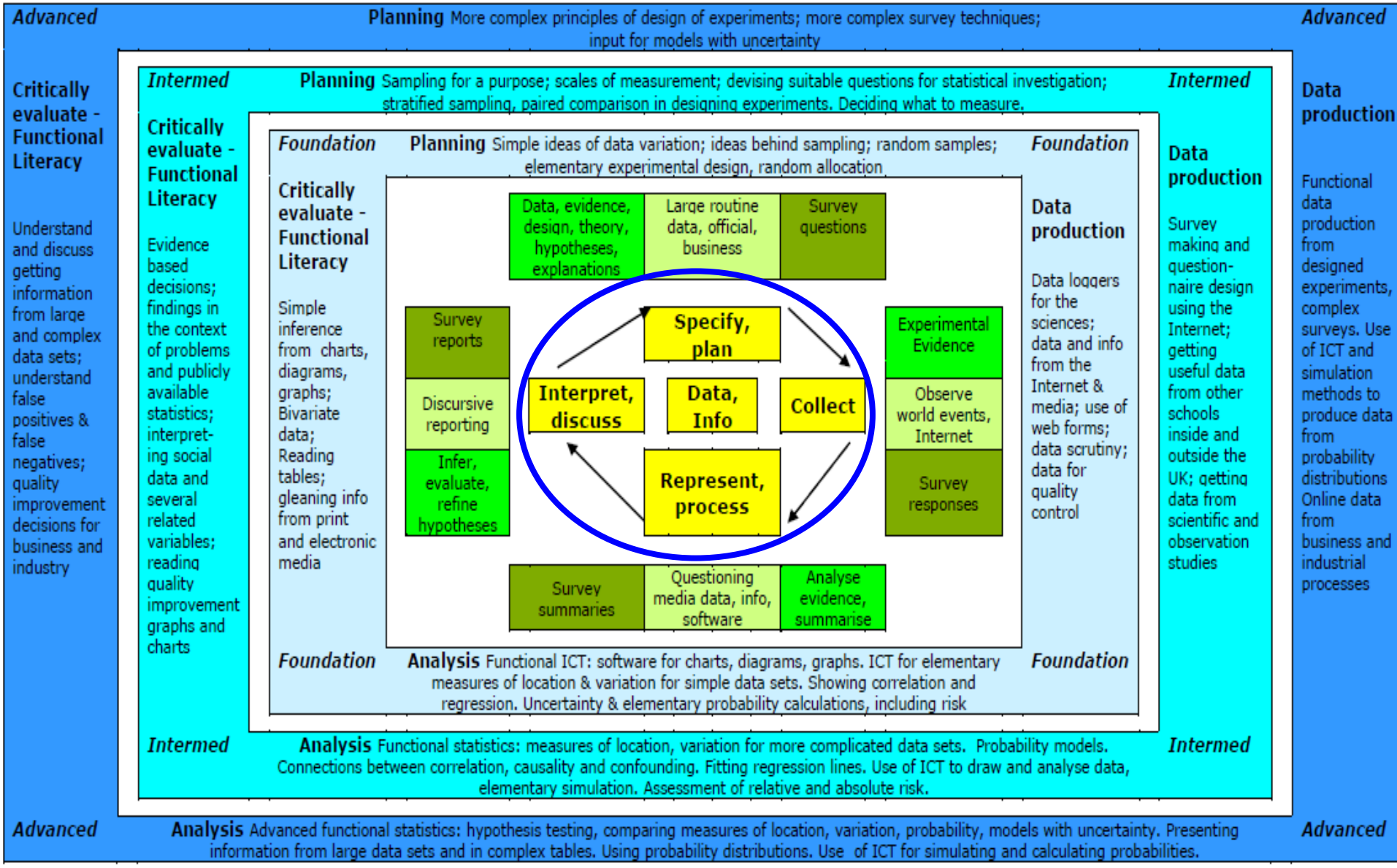
図形１　退学者への統計認識
数字－データ－情報－収集－発表－分析－議論－報告－意思決定



All school leavers should have knowledge and skills from doing the iterative cycle (yellow boxes) using material at intermediate (intermed) level

Diagram 1 Statistical Awareness for School leavers

Numbers-Data-Information-Collection-Presentation-Analysis-Discussion-Reporting-Decision Making



All school leavers should have knowledge and skills from doing the iterative cycle (yellow boxes) using material at intermediate (intermed) level

Extra Slides on 1d)
Maths Teacher Training Recommendations (2012)
1d）に関する別途スライド
数学教師のトレーニング提案

Recommendation 1
In-school Professional Development
提案１　学校内でのプロフェッショナルの育成

- Develop a programme of CPD for heads of mathematics and other subjects in how to teach statistics through problem solving
- 問題解決につながる統計教育の数学と他教科の指導者に、CPD（継続的な能力開発）プログラムを育成する

Recommendation 2
In-school Resources
提案２　学校内資料

- Develop a range of teaching material for heads of mathematics and other subjects in how to teach statistics through problem solving
- 問題解決につながる統計教育の数学と他教科の指導者に、幅広い教材を与える

Recommendation 3
Problem Solving Resources
提案３　問題解決資料

- The DfE should promote the development of a database of examples of teaching statistics through problem solving across the curriculum
- DfEは全てのカリキュラムに対して、問題解決につながる統計教育の実施例のデータベースの開発を、推進するべきだ

Recommendation 4
Online Professional Development
for teaching through problem solving
提案４　問題解決につながる教育のプロのオンライン育成

- The DfE should promote the development of online CPD designed to demonstrate the use of the resources in Recommendation 3.
- DfEは、提案３の資料の使い方を実際に見せるための、オンラインCPDの開発を推進するべきだ

Recommendation 5
Encourage Teacher self help
提案５　教員の自立を促す

- The DfE should give priority to the development of online CPD resources that will enable school teachers to take ownership of their CPD needs as in Recommendation 3
- DfEはオンラインCPD資料の開発の推進を優先すべきだ。これによって提案３であったように、教員がCPDの必要性に所有権を持てる。

Recommendations 1 – 5
提案１－５

- Focus on CPD and resources for teachers in post
  担当の教員のためのCPDと資料に焦点をあてる
- Urgent for these to be implemented
  実施を急ぐ
- Must ensure they get into the classroom
  授業に活用されることを保証する
- Can only achieve this with active participation of and support from the Department for Education
  教育技能省の積極的な参加と協力があってこそ達成できる

Statistics pedagogy　統計教育学

- Evidence from this research that
  この調査から得られた証拠
  - teacher training courses school mentors could improve students' pedagogic skills in statistics
    教員試験コースの指導者、学生の統計的教育スキルを伸ばすことができるかもしれない
  - experience of using the problem solving approach to teaching statistics is lacking
    統計教育での問題解決アプローチの使用体験が少ない
  - experience of seeing exemplar statistics teaching is lacking
    模範的な統計教育を見る経験が少ない
  - willingness to adequately address above deficiencies is not a current priority
    以上の不備に適切に対処することを現状の最優先事項としていない。

Statistics pedagogy in mathematics teacher training courses
数学教員育成コースでの統計教育論

The following recommendations are made to the Secretary of State for Education concerning the training of teachers who will be responsible for the teaching of statistics in schools and colleges

以下は、教育雇用省に対して提案された、学校や大学で統計を教える教員のトレーニングについての意見である

Recommendation 6
Professional Development for Teacher Training Course Leaders
提案６　教員トレーニングコース指導者の専門的整備

- Develop a programme of CPD for PGCE
- PGCEのためのCPDプログラムを作る
  - Mathematics course leaders and teachers responsible for mathematics training schools
  - 数学コース指導者と数学トレーニング学校の先生
  - Subject course leaders where statistics is used
  - 統計が使われている科目コース指導者
- The programme should use the problem solving approach for teaching
- このプログラムは、問題解決につながる教育アプローチを使用すべきである

Recommendation 7
Professional Development for Teacher Training Course Leaders
提案７　教員トレーニングコース指導者の専門的整備

- Develop a programme of CPD for teacher trainee school mentors in
- 教員指導者用CPDプログラムを作る
  - Mathematics and other subjects where statistics is used
  - 数学と統計の使われる他の科目
- The programme should use the problem solving approach for teaching
- このプログラムは、問題解決につながる教育アプローチを使用すべきである

Recommendation 8 CPD Materials
提案８　CPD資料

- Develop a comprehensive range of exemplar pedagogic resources that use real data, eg from other subjects, for teaching in schools
- 学校で教えるため、他教科からの本物のデータを使う総合的な模範教育資料を作る
- The resources should use the problem solving approach.
- この資料は、問題解決につながる教育アプローチを使用すべきである

Recommendation 9
CPD for Teacher Training Mentors in Schools
提案９　学校での教員指導者のためのCPD

- All teachers involved in teaching statistics, including school mentors, should undertake a certified CPD course in teaching statistics
- 学校指導者を含む統計を教えている全ての教員は、認定された統計教育のCPDコースを受けるべきだ

School Coordination of Statistics
学校における統計学のコーディネート

As long ago as 1984 Peter Holmes, then director of the Centre for Statistical Education at Sheffield University, recommended the establishment of a school coordinator for statistics across the curriculum.

The need is more urgent now than ever.

See also Porkess (2012)

1984年というかなり前から、シェフィールド大学の統計教育センター長のピーター・ホームズは、学校での統計カリキュラムのコーディネーター制定を提案した

今、その必要性はかつてなく差し迫っている

ポーケス（2012）もご覧ください

2b) Extra slides about QAA
QAAに関しての追加スライド

Recommendation 10
School Coordination of Statistics
提案10　学校における統計学のコーディネート

- Develop a coordination system for the teaching of statistics across all subjects in a school
- 全ての学校科目で統計を教えるためのコーディネートシステムを開発する

2b) Where does QAA come in?
QAAはどこに関わっているのか？

- QAA's job is to support higher education providers in meeting their responsibilities for standards and quality, and to check that they are doing so

  QAAの仕事は、高等教育の担当の責任である、基準と質を満たし、また彼らも満たすように支援し、またそうしていることを確認する
- To this end QAA publishes guidance to help them develop effective systems

  このため、QAAは効果的なシステムの開発を助ける、ガイダンスを出版している
- The principal element of this is the Quality Code

  その主な要素は品質規範である

The Quality Code
A brief guide
General introduction
Quality Code Part A
Quality Code Part B
Quality Code Part C
Development process
Development schedule
Progress updates
Resources
Event resources
How to get involved

UK Quality Code for Higher Education

Part A: Setting and maintaining threshold academic standards

Threshold academic standards are the minimum acceptable level of achievement that a student has to demonstrate to be eligible for an academic award. The Quality Code sets outs Expectations which higher education providers are required to meet to ensure that academic standards are set and maintained.

Chapters

Related links

Part B: Assuring and enhancing academic quality

Part C: Information about higher education provision

Explanatory notes on the construction of the Quality Code

The Quality Code
A brief guide
General introduction
Quality Code Part A
Quality Code Part B
Quality Code Part C
Development process
Development schedule
Progress updates
Resources
Event resources
How to get involved

UK Quality Code for Higher Education

Part B: Assuring and enhancing academic quality

Academic quality is concerned with how well the learning opportunities made available to students enable them to achieve their award. The Quality Code sets out Expectations which higher education providers are required to meet to ensure that appropriate and effective teaching, support, assessment and learning resources are provided for students; that the learning opportunities provided are monitored; and that the provider considers how to improve them.

Related links

Part A: Setting and maintaining threshold academic standards

Part C: Information about higher education provision

Explanatory notes on the construction of the Quality Code

Chapters

B1: Programme design and approval

B2: Admissions

B3: Learning and teaching (The previous version of this Chapter, which will be used in reviews until August 2013, is also available.)

B4: Student support, learning resources and careers education, information, advice and guidance (note this is the existing version of this Chapter; a revised version is currently available for consultation).

B5: Student engagement

B6: Assessment of students and accreditation of prior learning

B7: External examining

B8: Programme monitoring and review

B9: Complaints and appeals on academic matters (note this is the existing version of this Chapter; a revised version is currently available for consultation)

B10: Managing higher education provision with others (The previous version of this Chapter, which will be used in reviews until December 2013, is also available.)

B11: Research degrees (The previous version of this Chapter, which will be used in reviews until July 2013, is also available.)

UK Quality Code for Higher Education

Part C: Information about higher education provision

Public confidence in higher education relies on public understanding of the achievement represented by higher education qualifications. The Quality Code sets out an Expectation that higher education providers make available valid, reliable useful and accessible information about their provision.

Part C: Information about higher education provision.

Related links

Part A: Setting and maintaining threshold academic standards

Part B: Assuring and enhancing academic quality

Explanatory notes on the construction of the Quality Code

Who is responsible for standards and quality
誰が基準と質の責任を持つのか

- Universities and colleges are responsible for the academic standards and quality the UK higher education
- 大学は英国における高等教育の学問的な基準と質に関して責任がある

Purpose of the quality code
品質規範の目的

- to safeguard the academic standards of UK higher education
- 英国における高等教育における学問的基準を保護するため
- to assure the quality of the learning opportunities that UK higher education offers to students
- 英国における高等教育が学生に提供する学習機会の質を保証するため
- to promote continuous and systematic improvement in UK higher education
- 英国における高等教育の継続的かつ体系的な改善を推進するため
- to ensure that information about UK higher education is publicly available
- 英国における高等教育の情報が公開されていることを保証するため

Why the quality code is important
なぜ品質規範が大事なのか

- **The Code gives individual higher education providers a shared starting point for**
- **規範が各高等教育者に共通の出発点を与えられる**

  - setting and maintaining the academic standards of their higher education programmes and awards
  - 高等教育プログラムと賞の学問的基準を設定し維持する

  - assuring the quality of the learning opportunities they provide for students.
  - 学生に提供する学習機会の品質保証

Key Values of the Quality Code
（次ページ日本語訳）

- All students are treated fairly, equitably and as individuals.
- Students have the opportunity to contribute to the shaping of their learning experience.
- Students are properly and actively informed at appropriate times of matters relevant to their programmes of study.
- All policies and processes relating to study and programmes are clear and transparent.
- Strategic oversight of academic standards and academic quality is at the highest level of academic governance of the provider.
- All policies and processes are regularly and effectively monitored, reviewed and improved.
- Sufficient and appropriate external involvement exists for the maintenance of academic standards and the quality of learning opportunities.
- Staff are supported, enabling them in turn to support students' learning experiences.

品質規範の重要な価値基準

- 全ての学生は個人として平等、公正に扱われる
- 学生は各々の学習経験を方向づけることに関与する機会がある
- 学生は必要時に、正確、活発に勉強プログラムに関する情報を得れる
- 全ての勉学とプログラムに関する方針と過程は明確かつ透明である
- 学術的基準と学術的品質の戦略的な監視は、提供者の学術的統治の最高水準にある
- 全ての方針と過程は常に効果的に監視され、見直され、改善される
- 学術的基準と学習機会の質を維持するため、充分で適切な外部からの関与がある
- スタッフへの支援によって彼らが学生の学習経験を支援することが可能となっている

Part A

Part A: Setting and maintaining threshold academic standards

These Chapters cover the issues relevant to the setting and maintaining of academic standards.

Part B

Part B: Assuring and enhancing academic quality

These Chapters cover the issues relevant to ensuring that the quality of learning opportunities meets expectations and is continually being improved.

Part C: Information about higher education provision

This shorter Part is not subdivided into Chapters. It addresses how providers make available information that is fit for purpose, accessible and trustworthy.

What are Expectations?
（日本語次ページ）

- Each Chapter of the Quality Code sets out a specific **Expectation**. Expectations express key matters of principle that the higher education community has identified as important for assuring academic standards and quality.
- They make clear what UK higher education providers are required to do, what they expect of themselves and each other, and what students and the general public can therefore expect of all of them.
- Individual providers should be able to demonstrate they are meeting the Expectations effectively, through their own management and organisational processes, taking account of the unique needs, traditions, culture and decision-making processes of their own institution.

期待とは？

- 品質規範の各章は、特定の期待を設定している。期待は高等教育機関が学問的基準と質に重要だと認定した原理を表現している
- 英国の高等教育提供者が何をしなければいけないか明確にし、彼ら自身またはお互いに何を期待するのか、そして学生と一般大衆が何を期待できるのかを明確にする
- 各提供者は期待に効果的に見合っていることを、その組織特有の義務や伝統、文化、意思決定過程を考慮の上で，管理組織的手続きを通じて明示しなければならない

What are Indicators?
指標とは？

- Each Chapter of the Quality Code sets out a series of **Indicators** to help higher education providers meet the relevant Expectations
- 品質規範の各章は、高等教育提供者の期待に見合うよう手助けするため、指標が設定されている

- These are actions or approaches that higher education providers have agreed reflect sound practice.
- それらは高等教育提供者が健全な実務を反映すると合意した行動やアプローチである

- Each Indicator is accompanied by explanatory text which shows why it is important and suggests possible ways in which it might be addressed and demonstrated.
- それぞれの指標は、なぜそれが重要か示す説明文を伴い、それを用いて証明する方法を示している

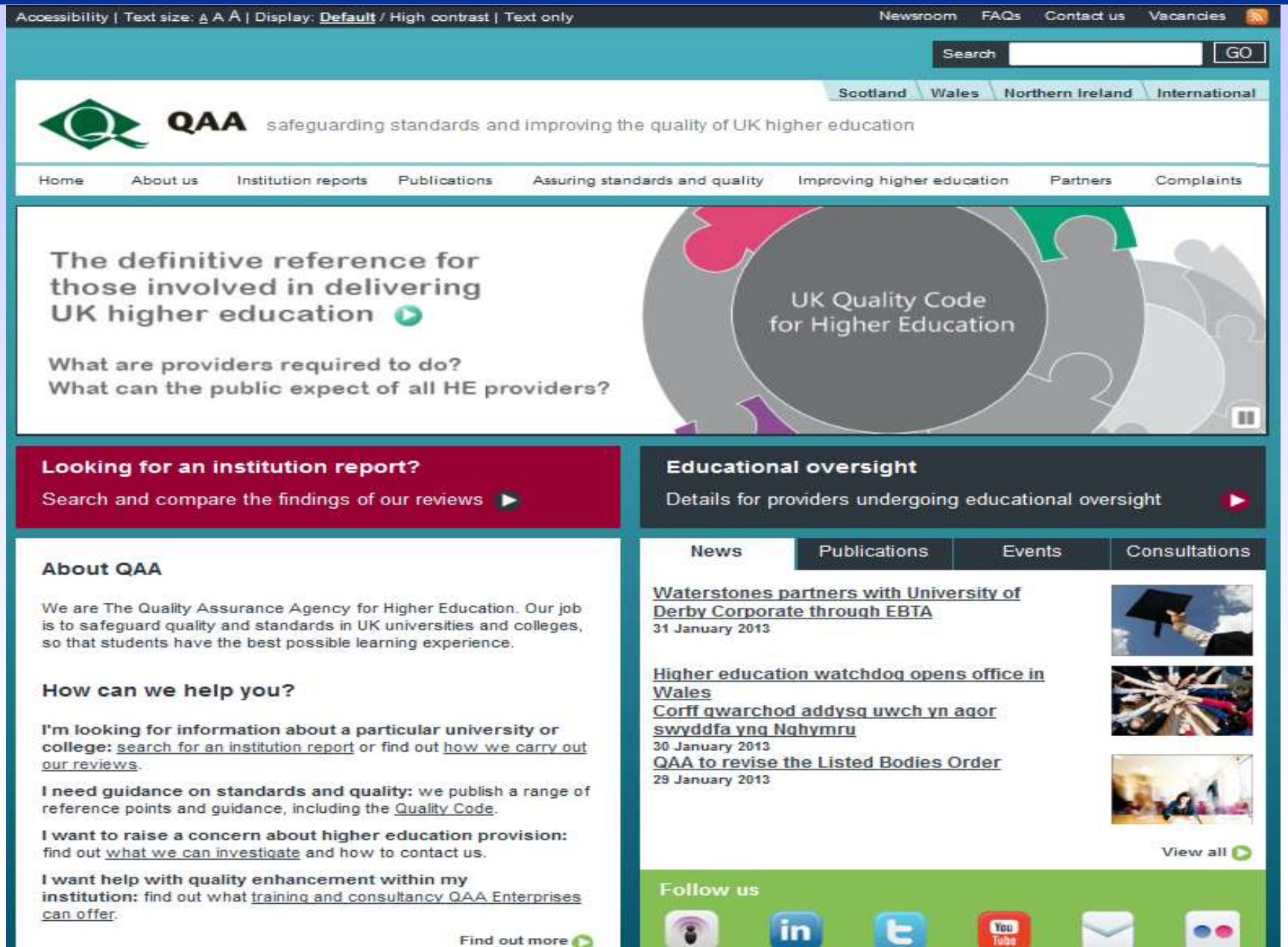
How has the Quality Code been developed?
どのように品質コードは発展してきたか？

- The Quality Code replaces the Academic Infrastructure, the previous set of reference points developed by QAA in partnership with the higher education sector.

品質規範は、QAAと高等教育部門の協力によって開発された，従来の参照基準であった、Academic Infrastructureに代わるものである

- It is owned by the UK higher education sector and is published and maintained by QAA on their behalf. QAA works with the sector to ensure that the Quality Code represents Expectations on which all higher education providers are agreed and that it remains up to date, through an ongoing process of review and revision.
- 品質規範は英国高等教育部門が所有し、彼らのためにQAAが公開し、整備している。 QAAは高等教育部門と協力して品質規範が全ての高等教育提供者が合意する期待を表現していることを保証し、常に審査、改訂している。

UK Quality Assurance Agency (QAA)
品質保証機構



National Institution for Academic Degrees and University Evaluation (NIAD-UE)
大学評価・学位授与機構 (NIAD-UE)

- QAA has a memorandum of understanding with NIAD-UE
- QAAはNIAD-UEとの覚書がある
  http://www.niad.ac.jp/english/about/index.html

apqn member

Information Package
Japanese Higher Education and Quality Assurance System

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- **Histrical Sketch**
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- **Organisation and Administration**
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  - General Staff
  - Academic Staff
  - Board of Councilors
  - Administrative Committee
  - Committee for Certified Evaluation and Accreditation
    Universities | Colleges of Technology | Law Schools
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  - Committee for Validation and Examination for Degrees

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1-29-1 Gakuen-nishimachi Kodaira-shi,Tokyo 187-8587 Japan TEL:+81-42-307-1500 FAX:+81-42-307-1552

National Institution for Academic Degrees and University Evaluation (NIAD-UE)
大学評価・学位授与機構 (NIAD-UE)

- QAA has a regular interaction with NIAD-UE
- QAAはNIAD-UEと常に交流がある
  http://www.niad.ac.jp/english/unive/international/cooperation.htm

apqn member

Information Package
Japanese Higher Education and Quality Assurance System

Cooperation with Overseas Quality Assurance Organizations

NIAD-UE strengthens partnerships with overseas quality assurance organizations to contribute to enhancing the quality of higher education and facilitating quality-assured international university collaboration through transnational collaborative activities. In particular, NIAD-UE works together with several partner organizations under bilateral Memoranda of Understanding (MoUs).

Cooperation with QAA

NIAD-UE concluded the MoU with QAA in February 2007. Under the MoU, we so far carried out some collaborative projects and exchanged each other's information on quality assurance. We regularly meet to discuss future cooperation.

News: NIAD-UE signed MoU with QAA (6 February 2007)

News: NIAD-UE holds meeting with QAA (3 July 2007)

News: NIAD-UE held meeting with QAA (31 July 2009)

- Initiative for Enhancing Mutual Understanding
  NIAD-UE has been conducting a project 'Initiative for Enhancing Mutual Understanding' in collaboration with QAA and other partner organizations. The project evolved the glossary project and aimed at developing a tool for information sharing on the quality assurance system in Japanese higher education. As a concrete idea, the 'NIAD-UE Information Package' was produced. Furthermore, NIAD-UE organized the 2010 International Information Package Workshop, as the pre-conference workshop for the 2010 APQN Conference, to provide an opportunity to discuss and share ideas and experiences on 'the concept of mutual understanding' among the international community.

  Publication: The NIAD-UE Information Package

Overview

Quality Assurance System in Higher Education

United Kingdom

NIAD-UE
National Institution for Academic Degrees and University Evaluation

Index

I. Basic information on the country　この国の基本情報

Name of country	United Kingdom of Great Britain and Northern Ireland	
Capital	London	
Major language	English	
Population*	60,975,000	
Nominal GDP**	2,803,000 million USD (2007)	
Nominal GDP per capita**	46,041 USD (2007)	
Public spending on education as a percentage of the total government spending**	All levels of education 11.7% (OECD average 13.4%)　HE level 2.3% (OECD average 3.1%)	
Public spending on education as a percentage of GDP**	All levels of education 5.3% (OECD average 5.4%)　HE level 1.0% (OECD average 1.3%)	
Spending per student at higher education level**	11,484 USD	
Public spending on higher education per student**	7,993 USD	
Progression rate into higher education***	English domiciled students, aged 17-30 2000/01 - 40%　2005/06 - 43%	
Organization of education system***	See II-2. Organization of the education system, page 8.	

Glossary of Quality Assurance in Japanese Higher Education
日本の高等教育における質保証用語集

- NIAD-UE produced under the cooperation with the United Kingdom's Quality Assurance Agency for Higher Education (QAA).
- NIAD-UEは英国高等教育質保証機構（QAA）との協力により発足された
- Promotes the understanding of Japanese higher education systems, quality assurance systems, and develop international partnerships in the area of quality assurance
- 日本の高等教育制度、質保証制度への理解を促進し、質保証の国際的な連携を発展させる
- Key terms considered important for the clear understanding of those system
- それらの制度の明確な理解に重要な述語

apqn member

Publication: **Glossary of Quality Assurance in Japanese Higher Education**

View glossary

- Contained key terms of Japanese higher education system, quality assurance system, and NIAD-UE's evaluation works
- 117 terms with definition
- Bilingual format (English-Japanese)
- Attached Index

NIAD-UE produced the booklet 'Glossary of Quality Assurance in Japanese Higher Education' under the cooperation with the United Kingdom's Quality Assurance Agency for Higher Education (QAA). It aimed to promote the understanding of Japanese higher education systems, quality assurance systems, and develop international partnerships in the area of quality assurance through providing useful information. This glossary contains key terms considered important for the clear understanding of those systems and our works. We hope it will be widely used in various situations.

This glossary will be periodically revised to make it more functional, through comments from experts, the public, and amendment of relevant laws or trends of quality assurance in Japanese higher education. Your comments and indications on this glossary would be highly appreciated.

▲Go to the top of this page

http://www.niad.ac.jp/english/unive/publications/glossary.htm

First Edition
third edition soon…

Glossary of Quality Assurance in Japanese Higher Education

高等教育に関する質保証関係用語集

English-Japanese

Contents

Introduction

It is becoming socially required that third parties evaluate education and research activities of higher education institutions to improve and enhance their quality continuously. The concept of 'evaluation for quality assurance' has become widely known across the world since the late 20th century. This movement may be called the dissemination of the evaluation culture.

The National Institution for Academic Degrees and University Evaluation (NIAD-UE) engages in multiple evaluation schemes to create and develop an evaluation culture. We seek ways to propagate the significance of evaluation to those involved in higher education by providing useful information.

Moreover, it is increasingly important to develop international cooperation among quality assurance bodies, due to the growth of education and research activities crossing the borders of languages and education systems.

In this context, NIAD-UE signed a Memorandum of Understanding with the United Kingdom's Quality Assurance Agency for Higher Education (QAA) to establish a strategic alliance for enhancing quality assurance in higher education. In order to enhance the effectiveness of collaborative activities, it is first essential to build a high level of common understanding of each other's system and background of quality assurance systems by various methods, including the effective exchange of information.

Containing 117 key terms considered important for the clear understanding of the Japanese quality assurance system and NIAD-UE's evaluation activities, this booklet is produced as part of this approach. These terms were selected and translated by careful analysis and consideration by our working group and external experts.

I hope this booklet will help all to deepen the understanding of Japanese higher education and NIAD-UE's evaluation activities, and therefore contribute to the development of the evaluation culture.

I would like to express my special thanks to Mr. Peter Williams, Chief Executive of the QAA, for his great contribution to the production of this booklet.

November 2007

Akihiko Kawaguchi
Vice-President of NIAD-UE

序　文

高等教育機関の行う教育研究活動を第三者が評価し、その結果により質の改善や向上を図ることが社会的に求められています。このような改善のための評価という考え方は二十世紀後半から国際的にも広がっており、これを「評価文化」と呼んでいます。

独立行政法人 大学評価・学位授与機構は、評価文化の醸成・発展を図るために、多元的な評価活動を通じて、高等教育の質の改善・向上に資する恒常的な評価の促進を目指しています。また、評価に関する有益な情報の提供を通じて、高等教育を取り巻く社会における評価の普及に努めています。

また、言語や教育制度の違いを超えた国際的な教育研究交流の活発化のために、高等教育の質保証を担う機関の国際的な協力活動が重要となってきています。

こうしたなか、当機構は、英国高等教育質保証機構（the Quality Assurance Agency for Higher Education, QAA）との間で日英両国の高等教育の充実発展に資することを目指して、高等教育質保証分野での連携に関する覚書を締結しました。この覚書に基づく諸活動を効果あるものとするためには、両機関の高等教育分野に関する情報交換などにより、高いレベルの相互理解を構築しておくことが不可欠です。本書では、日本の高等教育の質保証及び当機構の行う評価に関する専門用語の定義および英訳に関して各方面との意見交換を経て117語を収録しました。

本書を通じて、国内外を問わず、広く皆様方の、わが国の高等教育及び当機構の評価事業への理解が深まり、評価文化の醸成・発展の一助となればこの上ない喜びです。

最後に、本書を作成するに当たって、多大なご支援、ご協力をいただいたQAAのピーター・ウィリアムズ理事長に対し心からお礼申し上げます。

2007年11月

独立行政法人　大学評価・学位授与機構
理　事　　川　口　昭　彦

transition from secondary education and increasing the effectiveness of regular *programs*. Recently, various introductory education schemes have been introduced such as upper secondary school students experiencing *university* classes and the remedial education of subjects while in upper secondary school.

J

Junior College

A college which offers two or three-year higher education and requires graduation from upper secondary schools or equivalent academic ability for admission. Students who graduate from junior colleges are awarded an Associate Degree.

L

Learning Support

A comprehensive support system in *higher education institutions* which enables students to concentrate in studying effectively, such as guidance for taking courses, student counseling and advice.

Liberal Education

Education designed to nurture students' appreciation of the richness of humanity, giving them broader perspectives, abilities to judge appropriately and self-actively, and to consider their own knowledge and lifestyles in society by providing knowledge and skills commonly required beyond the limits of each subject, unlike more narrowly focused education that offers knowledge in vertically divided fields.

M

Major

A basic structure set up under an *academic unit* in a *graduate school* for the attainment of educational and research objectives.

程に付随した教育。近年、大学の授業への高校生の参加や高等学校時の未履修科目の補習教育など各機関において多様な導入教育が実施されている。

短期大学

高等学校を卒業した者又はこれと同等以上の学力をもつ者を入学資格とし、修業年限を2年又は3年とする高等教育機関。卒業すると短期大学士の学位を得ることができる。

関係法令：学校教育法第108条

学習支援

高等教育機関において、学生が教育課程を効果的に遂行するために整備された総合的な支援体制。履修指導や学生相談、助言体制の整備など。

教養教育

縦割りの学問分野による知識伝達型の教育とは異なり、学問分野の枠を越えて共通に求められる知識や技法を提供することにより、学問の裾野を広げ、様々な角度から物事を見ることができる能力や、自主的・総合的に考え的確に判断する能力を培い、豊かな人間性を養い、自分の知識や人生を社会との関係で位置付けることのできる人材を育てることを理念・目的とする教育。

専攻

大学院における教育研究上の目的を達成するための基本的組織で、研究科の下に置かれる。

関係法令：大学院設置基準第6条

- http://www.qaa.ac.uk/Publications/InformationAndGuidance/Documents/Recognition-scheme.pdf
- this document describes the process for developing subject benchmark statements.
- この文書は 科目のベンチマークステートメントを開発する過程を説明している。
- I understand that there was an agreement for MEXT to translate up to 20 subject benchmark statements a few years ago
- 数年前にMEXT文部科学省が２０科目のベンチマークステートメントを翻訳することになったと聞いた

- http://www.niad.ac.jp/english/unive/publications/information_package.htm
- this incorporates the second edition of the glossary
- これは第2版の用語集が含まれている

2b) End of extra slides about QAA
QAAに関しての追加スライド終了

Extra slides – information about statistics knowledge and pedagogy in UK maths teacher training courses

追加スライド　-　イギリス数学教師育成コースでの統計知識と教育法情報

(I) Background　背景

- Teaching Statistics Trust funding 2010-2012
  統計教育信託基金2010-2012
- Combined qualitative/quantitative approach to university maths teacher training students
  大学数学教師トレーニング学生への量と質の混じり合ったアプローチ
  - visited five universities
  - 5大学を訪問
  - in-depth discussions, notes and surveys with 128 student
    128人の学生と 徹底的な議論、記録と調査
- Small, limited survey of newly qualified teachers (NQTs)
  新しい正規教員（NQTs）に関する、限定された小規模の調査
- Phone interviews 電話アンケート
  - 17 maths university maths teacher training course leaders
  - 17の数学大学の数学教師育成コースの指導者達に
  - same set of questions, but discussion as well
  - 同じ質問と、議論もした
- Endorse findings of RSSCSE/QCA report (2006)
  RSSCSE/QCA調書（2006）の研究結果を承認する
  - and anecdotal evidence over 40 + 40 + 35 +35 = 150 years
  - 40 + 40 + 35 +35 = 150 年分の事例証拠

(II) Students – background
学生- 背景

- *Mixed messages about statistics from their school teachers and university tutors*
  学校、大学教員からの混乱した統計教育
- *Great variation in knowledge of statistics on entry to university maths teacher training* *大学数学教員トレーニングに入る段階で統計学の知識には大きなばらつきがある*
- *Confusion over what statistics is for and about*
  統計学とは何か、何のためかについての混乱
  - *set of procedures and formulae into which you substitute numbers*
  - *手順と数値を代入する公式のセット*
  - *not proper mathematics*
  - *本物の数学ではない*
  - *about real life, but getting real examples is hard*
  - *実生活に関するもの、しかし実際の例を入手することは難しい*
- *Good practice involves practical examples, but most had not experienced it*
- *良い演習は実例を含むが、多くの人はそれを体験していない*

(II) Students – experience
学生-　経験

- *Experience of teaching statistics in schools is by accident not design*
  学校で統計を教える経験は偶然で、意図的ではない
- *Support for pedagogy is sporadic*
  教育法へのサポートは散漫だ
- *Some* university maths teacher training *trainees are given the impression that statistics is boring and a nuisance*
  大学数学教師トレーニング講師の何人かは統計は退屈で、面倒なものだと思っている
- *Should be able to collect and experience their own data*
  彼ら自身のデータを収集し、経験できるべきだ
- *Little coordination between statistics teaching within and between other subjects at school*
  統計教育と他の科目の教育の連携はほとんどない

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(III) Newly qualified teachers
新しい正規教員

- Small self-selected sample
  自分で選択した小さな標本
- But responses consistent with focus groups and student undergraduates
  しかし回答は対象者および学部生と整合的である
  - confident about teaching using handling data cycle, but would not necessarily use it in their teaching
  - データサイクル処理を使った教え方に自信をもっているが、自分たちが教えるときに必ずしも使用しない
  - lack of confidence in some other statistical topics
  - 他の統計トピックに対しての自信がない

(IV) university maths teacher training Course Leaders
大学数学教員トレーニングコースの指導者

- Statistical knowledge was adequate for university maths teacher training students
  統計知識は大学数学教員トレーニングの学生に十分なものだった
- Statistics is 統計とは
  - part of mathematics
  - 数学の一部分
  - should not be treated any differently
  - 異なった扱いをすべきでない
  - takes the role of the application of mathematics
  - 数学の応用の役割を持つ
- An enquiry based approach to statistics should be used
  統計への調査ベースのアプローチが使われるべきだ
- Great variation in extent of statistics support
  統計サポートの程度は多種多様だ
- Pedagogic experience by accident, not design, at teacher training – severe time constraints
  計画によらない偶然の教育経験　-　厳しい時間的制約がある
- Desire to teach statistics through other subjects but little coordination with other subjects
  他の科目との調整をほとんどせず、他の科目を通して統計を教えたいという願望

(IV) University maths teacher training course Leaders
大学数学教員トレーニングコースの指導者

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(V) Discussion – evidence
議論　–　証言

- Self-perpetuating cycle of attitudes to statistics
  統計学に対する姿勢の自己永続的なサイクル
  - at school; in university service courses; some 'pure' mathematics degrees and back to school
  - **学校、大学の学部コース、いくつかの"純粋"数学学位、そしてまた学校へ**

- University maths teacher training courses could do better at equipping maths teachers
  大学数学教員トレーニングコースは数学教員の育成のために改善できる
  - with appropriate level of statistics knowledge
  - **適正な水準の統計知識を持つ**
  - with statistics teaching skills
  - **統計教育スキルがある**
  - recognise severe time constraints
  - **厳しい時間的制約を認識する**

- Supported by RSSCSE/QCA report (2006)
  RSSCSE/QCA 報告 (2006)によりサポートされている
  - head of mathematics in schools
  - **学校の数学リーダー**
    - lack of statistics knowledge
    - **統計知識の不足**
    - lack of confidence to teach statistics in KS3 curriculum
    - **KS3カリキュラム内で統計を教える自信の欠如**

Quotes　引用

- *The general consensus within the school is that statistics is a lesser, boring subject*
  統計は軽く、つまらないものだという学校での共通意識がある

- *I'm clear on the curriculum but not how to teach it (Statistics)*
  カリキュラムについては明確だが、実際どのように統計学を教えるのかわからない
- *Data is what makes statistics enjoyable to students.*
  データが生徒にとって統計学を楽しいものにしている
- *The statistics taught within the current curriculum does not reflect what is used in the real world of work. It is an area that needs, in my opinion, to be completely reviewed to reflect the modern use of data.*
- 今教えられている統計学は、実際の仕事上で使われている統計を反映していない。私の意見では、統計学は現在のデータ利用を反映するために全面的に改定されるべき分野である。
- *I'm going to make it (teaching statistics) more exciting and practical (than I saw).*私は統計教育をもっと楽しいものにする(私が見てきたものより)

End of Extra slides – information about statistics knowledge and pedagogy in maths teacher training courses

追加スライド終了 - イギリス数学教師育成コースでの統計知識と教育法情報

3a) Extra slides on STEM graduate curriculum
STEM卒業カリキュラムについての追加スライド

3a) The curriculum content - learning objectives
カリキュラムの内容 – 学ぶ目的

- What STEM graduate employees should
  STEMを卒業した従業者は以下であるべき
  - i) be able to fully understand or do 完全に理解し、行うことができる
  - ii) be able to identify and critically evaluate 確認、厳しい評価ができる
  - iii) know about 知識がある
- Find at www.rsscse-edu.org.uk/ このページを見よう

A Statistical Awareness Curriculum for STEM Graduate Employees

National HE STEM Programme

The Statistical Awareness Curriculum for STEM Graduate Employees aims to produce:

a) a web-based self-audit tool to be used by STEM employers to audit the statistical skills of their workforce;

(b) a curriculum that can be taught to STEM employees using distance learning.

Please view the course outline for further details.

Click the course title and then click 'Login as a guest'.

3a) The curriculum content - learning objectives
カリキュラムの内容　–　学ぶ目的

Statistical Awareness Curriculum for STEM Employees presents three curricula that were agreed after discussions with a range of STEM employers. The specifications cover what STEM graduate employees should be able to:

- fully understand or do;
- identify and critically evaluate;
- know about.

You can view and download the Curriculum document in both .doc and .pdf format below.

HE STEM Statistics Curriculum (DOC)
HE STEM Statistics Curriculum (PDF)

1

Statistic[illegible]wareness Curriculum Questionnaire PDF
Statistic[illegible]wareness Curriculum Questionnaire

The questionnaire contains 10 questions; 6 compulsory multi-choice questions followed by 4 optional text entry questions, in addition there are optional text entry questions that appear dependent on your response to each of the multi-choice questions.

The questionnaire should not take you longer than 10 minutes, possibly longer if you provide detailed support text where requested.

3a) The curriculum content - learning objectives

ROYAL STATISTICAL SOCIETY
Centre for Statistical Education
WITH PLYMOUTH UNIVERSITY

National HE STEM Programme

This document presents the three curricula that were agreed after discussions with a range of STEM employers. The specifications cover what STEM graduate employees should be able to:

- fully understand or do;
- identify and critically evaluate;
- know about.

An Agreed Statistical Awareness Curriculum for STEM Employees

---

1) STEM graduate employees should be able to fully understand or do;

- for a given problem, use a problem solving approach to make evidence based decisions, that is they should be able to:
  - identify relevant questions that need to be answered; identify the target population; recognise the population structure and properties; choose an

3a) The curriculum – online audit tool
カリキュラム　–　オンラインツール

Find pdf at www.rsscse-edu.org.uk　ここにPDFがあります

Online at http://bit.ly/hestemc　ウェブサイトはここ

Content　内容

- Section 1 Understanding the Problem Solving Approach
  問題解決的アプローチを理解する
- Section 2 Recognition of Population Structure　集団の構造の認識
- Section 3 Summary/Descriptive Statistics　要約統計量／記述統計学
- Section 4 Probability and Uncertainty　確率と不確実性
- Section 5 Randomness and Sampling Variability
  ランダム性と標本の変動性
- Section 6 Inferring Population characteristics from samples
  標本から母集団特性の推測
- Section 7 Process Control　工程管理
- Section 8 Experience of statistics at work and college/ university
  職場、大学での統計経験

3a) The curriculum - online audit tool
カリキュラム　–　オンラインツール

Statistical Awareness Curriculum for STEM Employees presents three curricula that were agreed after discussions with a range of STEM employers. The specifications cover what STEM graduate employees should be able to:

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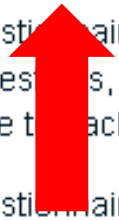
You can view and download the Curriculum document in both .doc and .pdf format below.

HE STEM Statistics Curriculum (DOC)
HE STEM Statistics Curriculum (PDF)

1

Statistical Awareness Curriculum Questionnaire PDF
Statistical Awareness Curriculum Questionnaire



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The questionnaire should not take you longer than 10 minutes, possibly longer if you provide detailed support text where requested.

ROYAL STATISTICAL SOCIETY
Centre for Statistical Education

A Statistical Awareness Curriculum for STEM Graduate Employees

The questionnaire contains 11 questions; 8 compulsory multi-choice questions and 3 optional text entry questions, in addition there are optional text entry questions that appear dependent on your response to some of the multi-choice questions.

Three training examples are provided to illustrate how you should allocate a scale value for your answers. the first two follow immediately and the third appears before section 6.

Ability scale	Description of ability
No ability	No ability - not competent
Some knowledge	Have some knowledge but no skill
Basic skill	Can do with assistance on a day to day basis (Have basic skill, need support to be effective)
Proficient	Can do solo (Proficient in the skill and able to show others how to use it)
Expert	Expert - Can train others

Training Example 1: Measuring of Average

Description of ability	Ability scale
No ability - not competent	No ability
Can define the mean, median mode	Some knowledge
Know how to calculate the mean, median and mode and the differences between them	Basic skill
Know how to calculate the mean, median and mode; know which situations each of mean, median and mode should be used in and can explain this to others	Proficient
Know how to calculate and use the mean, median and mode to make comparisons between different samples or populations and able to explain this to others	Expert

ROYAL STATISTICAL SOCIETY
Centre for Statistical Education

A Statistical Awareness Curriculum for STEM Graduate Employees

0% 100%

Section 1 Understanding the problem solving approach

*
How would you rate your ability in each of the following? (When confronted with a problem)

	No ability	Some knowledge	Basic skill	Proficient	Expert
Planning an investigation and defining the problem	○	○	○	○	○
Identifying relevant questions that need answering	○	○	○	○	○
Recognising what data needs to be collected	○	○	○	○	○
Choosing appropriate methods for collecting the data	○	○	○	○	○
Collecting appropriate data	○	○	○	○	○
Assessing the quality of the data	○	○	○	○	○
Identifying appropriate	○	○	○	○	○

3a) An exemplar resource – Analysis of Variance
実例資料　-　分散分析

2

A Sample Resource

For this project we developed a sample resource in just one STEM subject area. In designing the resource we adopted the following guiding principles:

- it should deal with a topic that employers would perceive as forming part of the curriculum dealing with statistical topics that STEM graduates should be able to identify and critically evaluate;
- it should be a topic that is applicable (albeit with differing context) across STEM disciplines;
- it should consist of a PowerPoint presentation; notes in support of the PowerPoint; and an additional exercise with supporting data;
- it should allow for both low and intermediate levels of mathematical skill.

The downloadable resource contains a PowerPoint presentation, *ANOVA Resource.ppt*. This should be viewed in conjunction with the notes on this topic which are in *RSSCSEHESTEM.pdf* and the Minitab Worksheet *Investigation1.MTW*. Finally a solution to Exercise 1 in the notes is available an a pdf file.

The resource *RSSCSE_HE-STEM.zip* that contains all these items can be downloadable below.

Sample Resource Download

3b) Extra slides
追加スライド

3b) Industrial problems for the HE Curriculum
HE カリキュラムのための産業の問題

- Real industrial data used throughout
- 本物の産業データが一貫して使われている
- All problems and solutions available from website
- 全ての問題と答えがウェブサイトに載っている
- Knowledge of the R software is not needed to obtain problems and solutions
- 問題と解答を得るのに、Rソフトウェアの知識は必要ない

3b) Implementation
実施

- Four level 1 problem topics identified
- 4つのレベル1の問題が確認された

Problem	Description
A	**Descriptive statistics and graphical presentation** 記述統計学とグラフ表現
B	**Confidence intervals for a single population mean** 一つの母平均のための**信頼区間**
C	**Hypothesis tests for a single population mean** 一つの母平均のための仮説検定
D	**Confidence intervals and hypothesis tests for two population means** 二つの母平均のための信頼区間と仮説検定

3b) Implementation
実施

- Five level 2 problem topics identified
- 5つのレベル2の問題が確認された

Problem	Description
A	**One way analysis of variance** **一元配置分散分析**
B	**Two way analysis of variance** **二元配置分散分析**
C	**Non parametric one way analysis of variance** ノンパラメトリック **一元配置分散分析**
D	**SPC control charts for mean and range** 平均と範囲の**SPC**（統計的プロセス制御）管理図
E	**SPC control charts for the mean process capability** 平均工程能力の**SPC**管理図