

MATHMET Activity MU Training

Skills Workshop, 17-18 May 2022

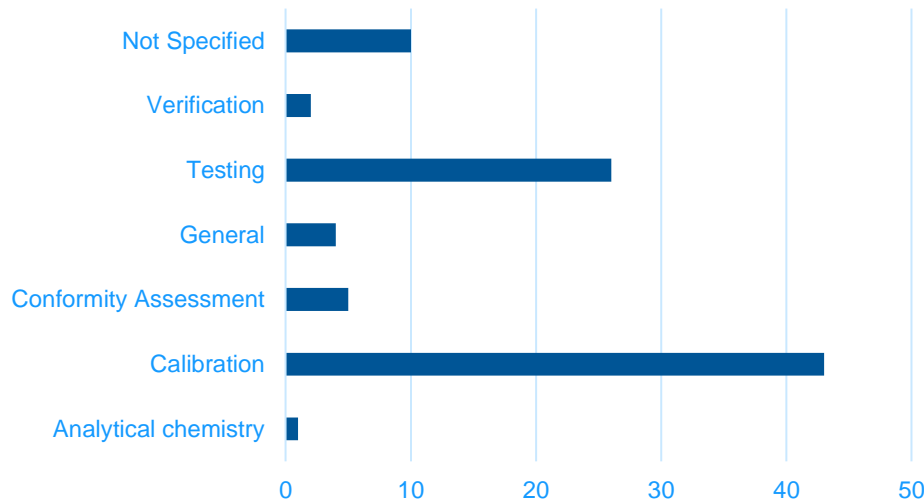
Survey of examples

Peter Harris
National Physical Laboratory

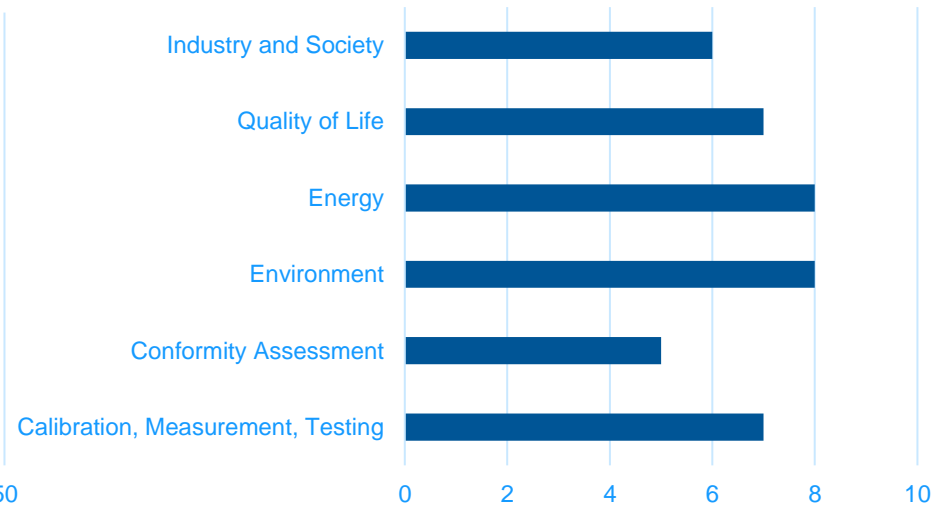
- Two sources of examples
 - Survey of existing courses (as part of A1.1.2)
67 examples spread over 40 training courses
 - Compendium of examples from EMPIR project EMUE “Examples of Measurement Uncertainty Evaluation”
41 examples over 6 broad application areas
- Features of the examples are summarised in a spreadsheet using the categories
 - Application area
 - Metrology area
 - Approach (to uncertainty evaluation)
 - Level (of difficulty)
- Results from high-level analysis and comparisons

Application area

APPLICATION AREA

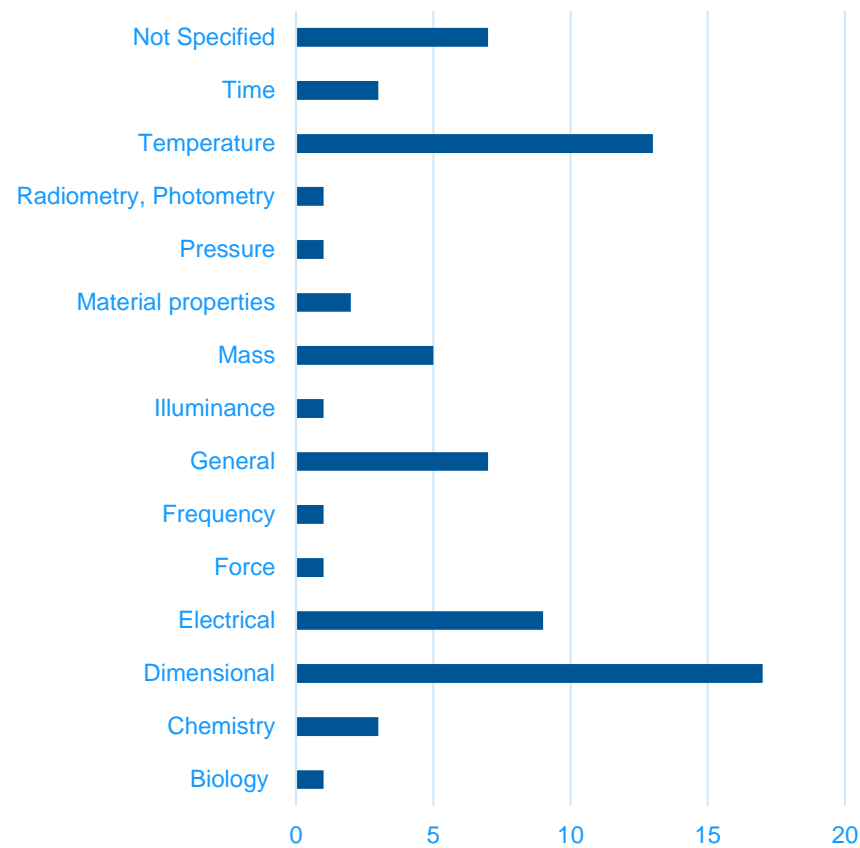


EMUE/APPLICATION AREA

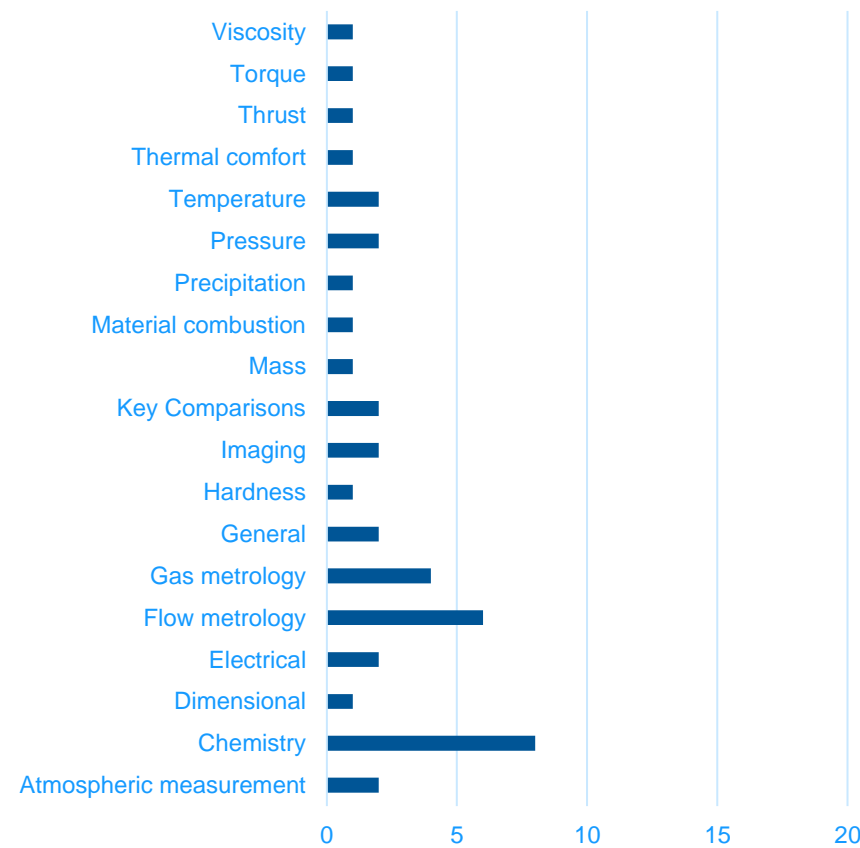


- For existing courses
 - Most (43/67) identify “calibration” as the application area
 - For some (10/67) no specific application area is identified
- For EMUE
 - The 6 application areas (“strategic areas”?) were fixed in advance and the distribution across those was uniform, largely by design
- In hindsight, we might have asked owners of existing courses to assign them to the application areas used in EMUE

METROLOGY AREA



EMUE/METROLOGY AREA

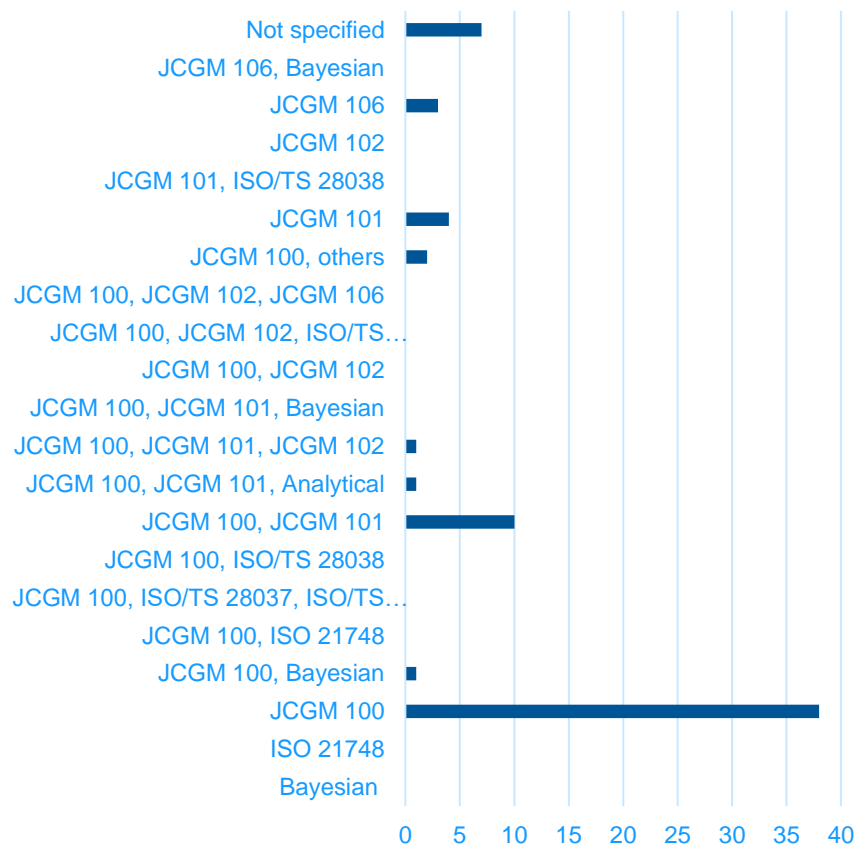


- For existing courses
 - There are 15 metrology areas (including “not specified”)
 - The top two are “dimensional” (17/67) and “temperature” (13/67), which together account for almost one-half of the examples
 - Maybe examples from these categories are considered easier to teach to a general audience?
- For EMUE
 - There are 19 metrology areas, with a more uniform distribution across them
 - The top two are “chemistry” (8/41) and “flow metrology” (6/41), which together account for only one-third of the examples
 - Maybe the examples reflect much more the interests of the participants in the project

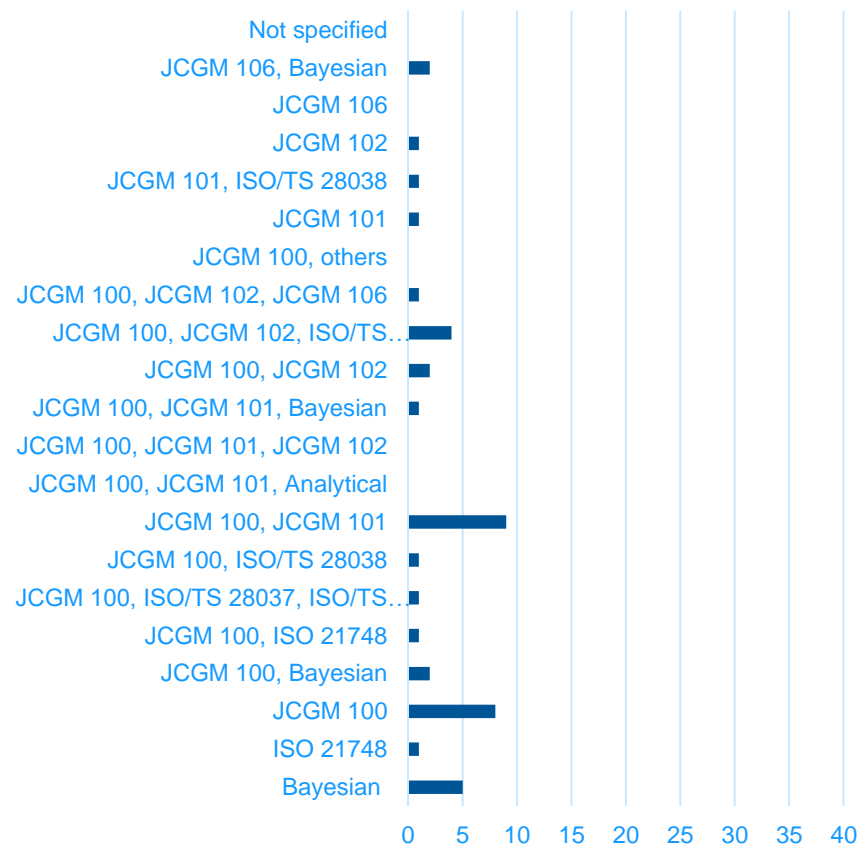
Approach

- 21 categories chosen as the union of those specified for the two sources

APPROACH

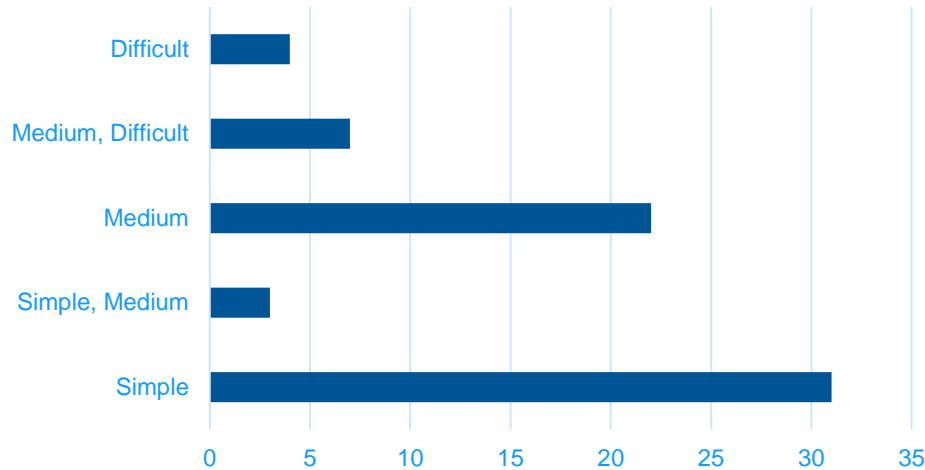


EMUE/APPROACH

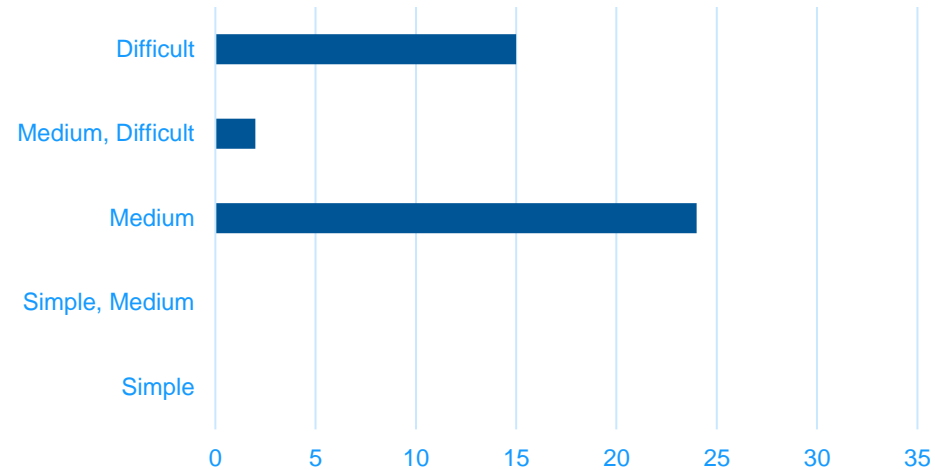


- For existing courses
 - Only 9 of the 21 categories are used
 - The top two are “JCGM 100” (38/67) and “JCGM 100/JCGM 101” (10/67), which together account for over two-thirds of the examples
- For EMUE
 - Here, 16 of the 21 categories are used
 - The top two are again “JCGM 100” (8/41) and “JCGM 100/JCGM 101” (9/41), but together they account for less than one-half of the examples
 - Bayesian approach and approaches related to regression problems (“ISO/TS 28037”, “ISO/TS 28038”) are also considered

LEVEL



EMUE/LEVEL



- For existing courses
 - Level selected by owner
 - Most are simple to medium (56/67)
- For EMUE
 - Level is (my!) subjective judgement regarding how a “non-expert” attending a training course might perceive the example
 - All are medium to difficult (41/41)

Summary

- Completed survey of 108 examples
 - 67 taken from existing courses; 41 taken from project EMUE
- Difficult to compare in terms of application area
- Examples taken from the two sources are complementary in terms of
 - Metrology area
 - Existing courses focus on examples related to dimensional and temperature measurement
 - Level (of difficulty)
 - Existing courses focus on examples that are simple to medium in difficulty
- Examples from EMUE offer a wider range of approaches
 - Bayesian, regression, “top-down” (ISO 21748)



Department for
Business, Energy
& Industrial Strategy

FUNDED BY BEIS

The National Physical Laboratory is operated by NPL Management Ltd, a wholly-owned company of the Department for Business, Energy and Industrial Strategy (BEIS).

- Are there comments on, or questions about, the analysis presented?
- What is our vision in collecting together (information about) the examples? How do we plan to use the results of the analysis?
 - Maybe to support teachers (to avoid having to replicate work)?
 - Maybe to address particular audiences?
- Do the results suggest gaps to be filled and particular needs?
- Are there other good sources of examples about which we should be aware?