

Fapas® ONLINE CHARTING FACILITY FOR PARTICIPANTS – A TECHNICAL GUIDANCE NOTE

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Introduction

The performance in a quantitative proficiency test (PT) is measured in most PTs by the use of the z-score. The interpretation of a z-score is well documented [1]. However, a single z-score by itself offers only the laboratory performance at the time of that PT. A better measure of laboratory performance is to understand the trend of z-scores over a long period of time. Furthermore, this can actually provide two measures; compliance (or otherwise) with the expected reproducibility precision and any systematic bias. Your accreditation body and customers will expect you to be plotting your participation data to identify and correct any trends in performance.

The caveat to this is that the laboratory should compare long term trends against PTs from the same provider, since different PT providers might apply different performance calculations. In particular, the standard deviation for proficiency assessment (denoted as σ_p in Fapas® reports) needs to be consistently derived.

The process of long term trending of PT performance is documented (see reference list in [1]) but not always easily applied and interpreted. It also relies on someone manually creating and constantly updating the generated control charts. Is there an easier and more cost-effective mechanism for undertaking this task?

The short answer is yes. The Fapas® SecureWeb interface for participants has this facility built in and has now been extended to include all the scheduled PT schemes, including the water and environmental sector. This technical note explains the concepts and mechanisms for accessing this (free of charge) facility as a Fapas® participant.

Reproducibility precision

There are different types of precision measurements, all of which involve an estimate of dispersion (or variance) around an accepted value. For the purposes of quality control charts, the type of precision of interest is that of reproducibility.

Relevant questions to ask are:

- How much do our results vary over a long period of time, across different analysts and materials?
- Is that variation under control?

Proficiency test assessments are defined by compliance to a known measure of reproducibility precision. This is the denominator σ_p (standard deviation for proficiency assessment [1]) in the z-score equation. In order for the control chart to be useful, σ_p has to be derived in the same way for each z-score being charted. Fortunately, the z-scores in Fapas® PTs are highly consistently derived, so charting z-scores from Fapas® assessments has both relevance and continuity. A control chart from Fapas® has that confidence of consistency automatically built in.

Note: charting z-scores obtained from different PT providers all together is only relevant if σ_p is derived in the same way between the different providers.

Probability and interpretation of precision

The normal probability distribution curve is a defining part of PT statistical processes. Therefore, there is approximately a 1-in-20 chance that a z-score will fall outside of ± 2 under normal

circumstances. This is why the Fapas[®] z-score histograms in reports and the control charts feature the -2 and +2 lines for ease of visual inspection.

It should be remembered that a z-score outside of ± 3 has a chance of occurring under normal circumstances only with a rate of about 1 in 300. A z-score between ± 2 and ± 3 might simply be a statistical anomaly and not necessarily require corrective action. Only a long-term knowledge of performance in the same type of PTs will establish the statistical probability for these occurrences for each laboratory.

Bias

There inevitably will be some bias in each analytical result but does that mean that the method being applied is biased? A z-score of exactly 0 will occur only rarely (zero bias compared to the assigned value). If your z-scores are consistently all positive or all negative values, however, that might indicate a bias in the method. If the proportion of z-scores approximates 50:50 (positive:negative) then this indicates a general lack of bias. A higher proportion of z-scores in one direction (positive or negative) indicates an over-estimate or under-estimate bias.

The Fapas[®] charting tool additionally provides an indication of the bias in the z-scores, from which appropriate action can be taken.

Fapas[®] SecureWeb charting

The charting facility for Fapas[®] participants is available from the Fapas[®] SecureWeb interface for each user. Having logged into 'My Account' the 'Charts - Go to Charts' link, takes you to the selection page. The facility is comprehensive, providing a variety of filters with which to target particular analyses (matrix / analyte combinations). Analyte groups and matrix groups can also be selected. The date range can be selected, or charts can be zoomed to particular time intervals. Further filters can be applied on the chart itself and additional detail on each data point can be viewed by hovering the cursor over the point.

Links to other Fapas[®] SecureWeb functions are available by clicking on the data points to go to the related PT report, certificate of participation and to search for similar products in the catalogue.

Since 2018, Fapas[®] results entry has permitted multiple results to be entered. The charting facility additionally shows these extra results, identified by a triangle icon, rather than the circle icon (representing the laboratory overall result). A 'Plot by Analyst' function further allows a quick and easy check of individual analyst or technician performance.

Note: you can only view charts for matrix / analyte combinations in which you have participated.

Further guidance on how to use the charting feature, which includes screen shots, is available as a separate document from our website [2].

Data exports

Some laboratories prefer to undertake their own charting or trending analysis, especially where there are multiple sites to include in such a comparison. Fapas[®] reports are locked and digitally signed PDF files, so historically, the only method to capture all the data was to transcribe each assessment manually. Now, as part of the new charting facility, there is also the option to download the same data in a spreadsheet-compatible format, to avoid the manual transcription.

References

- 1 Fapas[®], 2017, Protocol for Proficiency Testing Schemes, Version 6, April 2017, Part 1 – Common Principles, available from: fapas.com/technical-documentation
- 2 Charting Guide – October 2018.pdf, available from: fapas.com/technical-documentation