(K)ILO project

Proficiency tests for students

Presented By:

Kees van Putten

Senior Scientist,

Trilogy

KILO project: Metals

PRESENTATION CONTENT:

- General
- Challenges
- Results
- Conclusions
- Summary
- Winners
- Questions

KILO project: Metals

GENERAL INFORMATION Trilogy:

- Trilogy United States formed in 1999 and has since grown to locations throughout the world.
- Proficiency test organizer
- Quantitative and qualitative proficiency tests
- Participation is on an anonymous basis
- External experts
- Reference material manufacturer (Food/Feed)
- Independence
- Laboratory activities

KILO project ?

KILO project: Metals

GENERAL INFORMATION KILO project

A foundation of enthusiastic teachers from laboratory education, both MBO and HBO, supplemented by representatives from the business community and professional organizations, annually organize the so-called "(K)ILO school project" and a concluding symposium for the students.

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KILO project: Metals

GENERAL INFORMATION KILO project

The (K)ILO school project (Quality in Laboratory Education) are laboratory-evaluating inter-laboratory tests (proficiency tests) in the area of:

- Anions
- Clinical
- Gas chromatography
- Metals
- Microbiology
- Pharmaceutical

KILO project: Metals

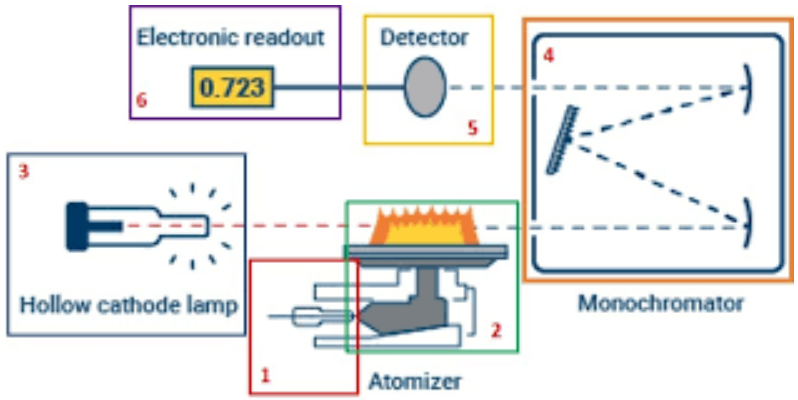
GENERAL INFORMATION KILO project:

In 2023, Trilogy Europe contributed to the KILO project ‘Metals’. It supplied the raw material, processed it, and later assessed the performance of the participating students from the different school laboratories in the Netherlands and give a presentation."

KILO project - Metals !

Minerals, trace elements and heavy metals
Bilateral proficiency test 2022

Premix
Product Number: BPT-MIN2022-KILO
Batch Number: TE22-C0137
Date of Production: November 2022
Remarks: Store at 2-8°C



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Students' challenges

Premix – [Fe] [Cu] [Mg] [Zn]

- Purpose and Requirements
- Literature study
- Grinding / dividing
- Preparation procedure sample
- Calibration strategy
- Measure technique
- Results
- Measure report
- Symposium
  - Poster
  - Defence results
  - Award ceremony

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Methods

Trilogy

- Feed premix (BPT-MIN2022-KILO)
- mixture of vitamins, minerals, trace elements and other feed additives that are incorporated mostly at levels between 0,2 and 0,5% in the compound feed
- Not for individuals commercially available

Students

- Analyse four parameters (Cu, Fe, Mg and Zn)
- Own developed preparation and calibration strategy
- AAS or ICP technique
- No reference for practicing and knowledge

Some Figures

- KILO project 24 years
- Sample dispatched to 10 lab schools
- 7 lab schools submitted
- 11 groups
- 44 results (Fe, Cu, Mg, Zn)
- 10x AAS
- 1x ICP

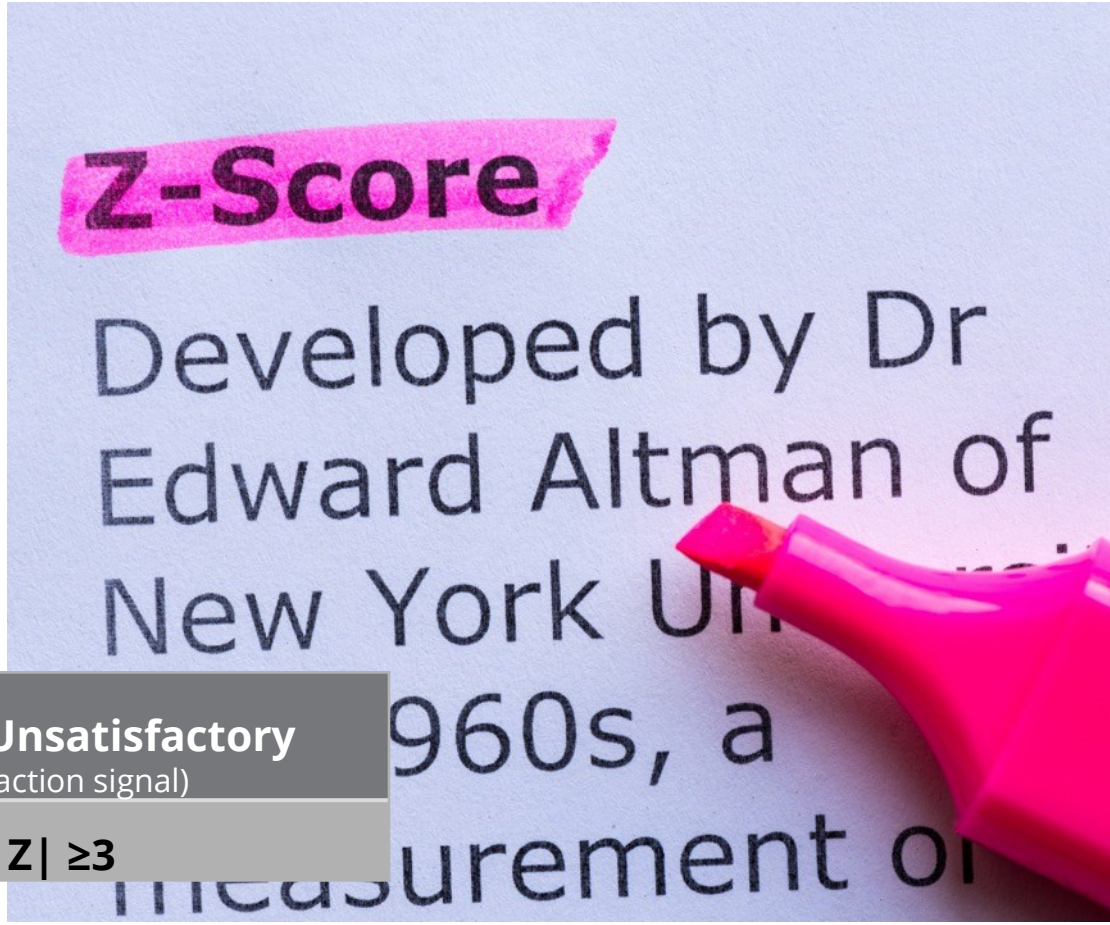
KILO project: Metals

Statistics:
Z-Score

The Z-score is used to compare the results obtained by different laboratories. Z-score is a numerical measure that indicates how many standard deviations a laboratory result deviates from the average

$$Z_i = \frac{x_i - X_{mean}}{s} \qquad Z_i = \frac{x_i - Xav}{SDPA}$$

Satisfactory (no signal)	**Questionable** (warning signal)	**Unsatisfactory** (action signal)
|Z| ≤ 2	**2 < |Z| < 3**	**|Z| ≥3**



KILO project: Metals

Results

Parameter	Unit	Assigned value Trilogy*	Students concensus value
Iron [Fe]	mg/kg	12625	4649
Copper [Cu]	mg/kg	1268	513
Magnesium [Mg]	mg/kg	11700	4645
Zinc [Zn]	mg/kg	7131	922

*Assigned values are from a regular previous Trilogy proficiency test

What's happening?

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Example Premix – Zinc [Zn]

School Lab nr	[Zn] mg/kg	Consensus Z_{Premix}	AV+SDPA Z_{Premix}	Overall Statistics	PREMIX [Zn]
111	1260,09↕	5,3	1,9	x̄	922,3
112	5,760	-0,5	-3,3	X	7131
113	0,738	-0,5	-3,3	Ux	1612
114	2680,0	0,9	-2,1	Uxrel	174,8 %
115	0,360	-0,5	-3,3	s	1934
116	0,686	-0,5	-3,3	SDPA	2139
117	7461,094↕	3,4	0,2	R	5416
118	30,270	-0,5	-3,3	Rrel	76,0 %
119	1,660	-0,5	-3,3	n	9*
120	66,950	-0,4	-3,3	* # without outliers	
121	5514	2,4	-0,8		
AV	7131	XXX	0,0		

Satisfactory	Questionable	Unsatisfactory
|Z| ≤ 2	2 <|Z|<3	|Z| ≥ 3

AV = Assigned value
SDPA = Standard deviation for proficiency assessment
↕ = outlier

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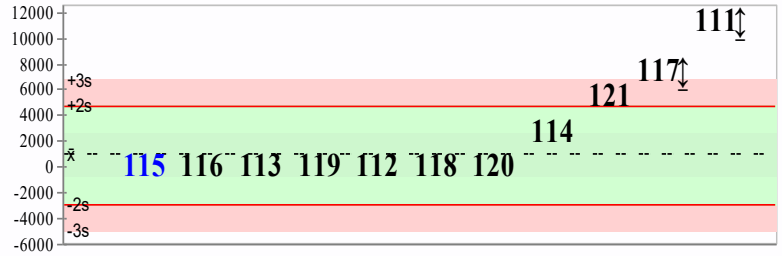
Results (Visual)

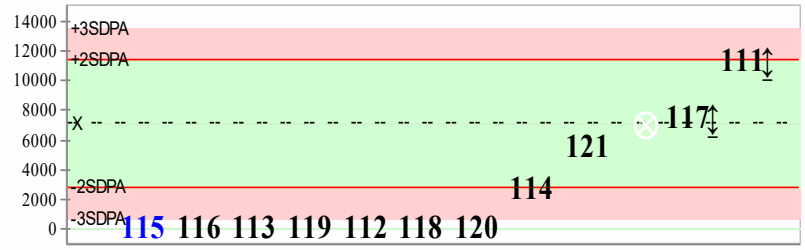
Premix Results

Sample:	Premix	Assigned value:	922,269 mg/kg (Empirical value)
Measurand:	Zink	Rel. SDPA:	209,7% (Empirical value)
Statistical method:	ISO 5725-2	Rel. repeatability s.d.:	not available
Number of laboratories in calculation + outliers:	11	Range of tolerance:	-2946,633 - 4791,171 mg/kg (|Z-Score| <= 2,0)



Premix Results

Sample:	Premix	Assigned value:	7131,000 mg/kg (Reference value)
Measurand:	Zink	Rel. SDPA:	30,0% (Reference value)
Statistical method:	ISO 5725-2	Rel. repeatability s.d.:	not available
Number of laboratories in calculation + outliers:	11	Range of tolerance:	2853,000 - 11409,000 mg/kg (|Z-Score| <= 2,0)



PROLab Plus

Results

- Eleven groups of students from different laboratory schools reported their results
- Large differences in Z-scores between Consensus values and Assigned Value/SDPA
- Differences due to two groups of results (high and low concentration).
- Remarkable:
  Two laboratory groups are outliers in example of zinc [Zn] in whole dataset but have good Z-score in the Assigned Value +SDPA approach.
- Consensus method that is assessed as satisfactory is between the range 72%-100%
- Assigned Value +SDPA is assessed as satisfactory is between the range 27%-36%
- Z-scores based on consensus are in this KILO project not suitable, because the real assigned value from earlier PT is almost 8 times higher.

Results

Plausible causes of low concentration

- Not grinding
- Weigh in too low
- Short destruction time
- Factor faults
- Different days between measuring calibration and sample
- No control if AAS was in specs

Conclusion

The students' PT results clearly show a significant difference in overall performance, Z-scores and number of outliers, when the statistical approach depends on the assigned value (derived from formulation or from consensus) and the SDPA (fixed or derived from algorithm A).

Differences occurs due to preparation and calibration strategies, available AAS and ICP equipment and time span of execution.

The (K)ILO project is a valuable instrument of learning and knowledge for future laboratory staff for understanding laboratory activities and their impact on PT results.

Conclusion

Additional remark:

Students' learn a lot from every step in this KILO project.

The closing symposium was a great event with laboratory schools from the Netherlands

KILO project: Metals

First prize


Kwaliteit in Laboratorium Onderwijs

Oorkonde

Stichting KILO en Trilogy verlenen

Celina Poelman en Nina Kuiper

van

Noorderpoort

De eerste Prijs in de categorie

Metalen/Mineralen 2023

Namens het bestuur KILO — Freerk Dousma

Namens Trilogy — Kees van Putten

Second prize


Kwaliteit in Laboratorium Onderwijs

Oorkonde

Stichting KILO en Trilogy verlenen

Robin van Leeuwen, Pascal Steen, Yvette van de Borg en Julian Stoffers

van

Noorderpoort

De tweede Prijs in de categorie

Metalen/Mineralen 2023

Namens het bestuur KILO — Freerk Dousma

Namens Trilogy — Kees van Putten

Summary

- Premix for feed (Trilogy)

- Assigned values:
  - Iron [Fe] = 12625 mg/kg
  - Copper [Cu] =1268 mg/kg
  - Magnesium [Mg] =11700 mg/kg
  - Zinc [Zn] =7131 mg/kg

- Large differences in Z-scores Consensus versus Assigned Value +SDPAZ-scores based on Consensus: results in KILO project not suitable
- Method Assigned Value +SDPA: realistic display performance
- Results Sd, RSD, BI, U not included

KILO project: Metals

An international (K)ILO project could create more awareness under (future) laboratory staff of the importance of proficiency tests and quality.

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Questions?

Contact

For information regarding any analytical services, products, or proficiency programs, we encourage you to contact us directly or speak with your sales representative.

Kees van Putten

Senior Scientist,

Trilogy