REPORT ON THE AFRICAN LASER CENTRE/
UNIVERSITY OF PRETORIA

SpecUP Spectrophotometer Workshop

18 & 19 November 2013
University of Pretoria
Pretoria
South Africa

Compiled by Dr Patricia Forbes
4 December 2013
OBJECTIVE OF THE WORKSHOP

The main objective of this workshop was to provide a platform for the rollout of the SpecUP spectrophotometer to South African and African universities.

In order to achieve this:
- Academics in analytical chemistry were the primary target audience
- Information regarding the SpecUP was disseminated to participants
- The participants each built their own SpecUP, which they took back to their universities for use in third year analytical chemistry student practicals
- Each participant took an additional SpecUP in kit form back to their universities for students to assemble
- Various applied experiments using the SpecUP were performed and discussed during the workshop. Participants exchanged practical manual details regarding existing UV-Vis experiments from their institutions for possible implementation using the SpecUP
- Questionnaires were distributed and discussed, which aim to assess the impact of use of the SpecUP on student’s understanding of spectroscopy. Ethical clearance for use of these questionnaires had been obtained from the UP Ethical Committee beforehand.

In this manner, all effort was made to ensure the implementation and sustained use of the SpecUP at the South African and African universities involved in the workshop.

APPLICATIONS RECEIVED

There was considerable response to the workshop announcement, in that twenty five applications were received, which was more than three times the number of participants which could be accommodated.

Selection of participants was based various criteria, the main ones being that the applicant should:
- Be lecturing analytical chemistry courses,
- Have the potential to implement the SpecUP in practicals (an academic has more potential than course tutor in this regard, for example), and
- Express interest in the SpecUP and in improving students’ understanding of spectroscopy, based on the motivation they wrote for their application.

The selection process also aimed at ensuring that there was a fair representation of participants from a range of African countries and academic institutions, as far as the budget would allow.

In this manner, a total of eight participants were selected, of which three were female and five were male. The participants originated from countries including Kenya, Lesotho, Botswana, Namibia and South Africa (see Figure 1), as detailed in the list of participants

in Appendix A of this report. In addition, one South African female presenter (Dr Patricia Forbes) and one South African male postgraduate student (Mr Johan Antowan Nöthling) were involved with the workshop organisation and presentation.

![Figure 1 – Countries represented by workshop participants](image)

**SEMINAR CONTENT**

The SpecUP Workshop programme consisted of a number of presentations as well as practical sessions (the full workshop programme is included in Appendix B). In this manner, participants were introduced to the SpecUP and the questionnaires which had been designed to evaluate the impact of use of the SpecUP on students’ understanding of spectroscopy. They also assembled their own SpecUP from the kit provided, and then used it in two modes: (1) using a coloured LED of complimentary colour to the solution of interest and (2) using a white LED and a diffraction grating to determine the visible absorbance spectrum of a potassium permanganate solution. Some photographs taken in the laboratory are included in Figure 2.
RESPONSE TO THE WORKSHOP

The workshop was very well received. Some participants felt that the SpecUP was time consuming to assemble (however, this is part of the learning process!). One participant also commented that the workshop should have been longer to allow for practical designing.

Most participants agreed that the SpecUP would help students to understand spectrophotometry and were keen to use them in their undergraduate practicals. Further most academics agreed that they would recommend the SpecUP to others and were keen to acquire additional SpecUP kits. Following from the workshop, the University of Namibia for example, has already requested an additional twenty SpecUP kits for their undergraduate practicals for 2014.

Comments received on the workshop evaluation forms included the following:
“It (the SpecUP) is very useful and will help students to have a clear picture of what is happening when making measurements”
“SpecUP is a brilliant tool”
“Thank you for the opportunity to attend: it has enriched me and offered opportunity of networking”
“Commercial spectrophotometers are easy to use if one considers that all that is needed is to press a button, but the underlying principles and concepts are lost, whereas the setting up of the SpecUP has challenges of alignment and time for setup, but improves understanding of the principles and concepts of spectroscopy tremendously”.

FINANCIAL INFORMATION

A total of R60 000,00 was received from the ALC to hold the workshop. Approximately 70% of this was spent towards accommodation and transport related expenses, which were the largest cost components, followed by the components required for the SpecUP kits (refer to Appendix C). R71 660,00 was requested in the funding application, however the same deliverables in terms of number of participants were realised on the reduced budget as a result of strict cost cutting initiatives (such as cheaper accommodation and selection of cheap air fares).

CONCLUDING COMMENTS

The SpecUP Workshop drew a very good response from applicants, which gives an indication that there was a need for this teaching tool. The response from participants was overall very positive. Communication with participants will continue in 2014, when the implementation of the SpecUP is planned to take place in third year Analytical Chemistry practicals at the institutions which were involved. The completed student questionnaires which are subsequently received will be evaluated by Dr Forbes and feedback will be provided to participants.

It is a costly exercise to transport participants from throughout Africa to South Africa and to accommodate them during the workshop. For this reason, applicants from north Africa could not be accepted due to budget constraints. It will be a more cost effective option to hold future workshops in other host countries (initial interest has been expressed by Tunisia, for example).

I would like to extend my thanks on behalf of both the organisers and participants to the African Laser Centre for their vital sponsorship of the SpecUP spectrophotometer workshop and to Dr Paul Motalane for his assistance. The kits could not have been assembled without the help of the mechanical and electrical technicians (Mr Nico van Vuuren; Mr Leon Engelbrecht and Mr David Masemula) of the Department of Chemistry at the University of Pretoria, who are greatly thanked for their efforts. The Departmental accountant, Naomi Steenkamp, also assisted significantly.

The SpecUP Workshop gave the ALC good exposure in that a number of participating academics were not previously aware of it. The institution from which one participant was from does not have any spectrophotometers at all, therefore the impact of obtaining two SpecUP kits was surely very significant.
APPENDIX A – LIST OF PARTICIPANTS

<table>
<thead>
<tr>
<th>Title</th>
<th>Surname</th>
<th>First name</th>
<th>Sex</th>
<th>Country of origin</th>
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<tbody>
<tr>
<td>Dr</td>
<td>Forbes</td>
<td>Patricia</td>
<td>Female</td>
<td>South Africa</td>
<td>University of Pretoria</td>
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<tr>
<td>Mr</td>
<td>Ishola</td>
<td>Anthony</td>
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<td>University of Namibia</td>
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<tr>
<td>Mr</td>
<td>Khoabane</td>
<td>Ntai</td>
<td>Male</td>
<td>Lesotho</td>
<td>National University of Lesotho</td>
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<tr>
<td>Prof</td>
<td>Motgalaka</td>
<td>Ntebogeng</td>
<td>Female</td>
<td>South Africa</td>
<td>TUT</td>
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<tr>
<td>Mr</td>
<td>Nöthling</td>
<td>Johan</td>
<td>Male</td>
<td>South Africa</td>
<td>University of Pretoria</td>
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<tr>
<td>Mr</td>
<td>Osano</td>
<td>Aloys</td>
<td>Male</td>
<td>Kenya</td>
<td>Maasai Mara University</td>
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<tr>
<td>Mr</td>
<td>Simion</td>
<td>Misoi</td>
<td>Male</td>
<td>Kenya</td>
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<tr>
<td>Dr</td>
<td>Takuwa</td>
<td>David</td>
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<td>Botswana</td>
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<tr>
<td>Mrs</td>
<td>Wicht</td>
<td>Merrill</td>
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<td>CPUT</td>
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<tr>
<td>Miss</td>
<td>Zulu</td>
<td>Happy</td>
<td>Female</td>
<td>South Africa</td>
<td>UNISA</td>
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APPENDIX B – SPECUP WORKSHOP PROGRAMME

MONDAY 18 NOVEMBER

09h00  Arrival at venue (Building NW1, Room 2-32 Mendeleev Lecture Room), Registration

09h15  Welcome (Dr Patricia Forbes)

09h25  Opening of the workshop and welcome (Prof Egmont Rohwer, HOD Chemistry, UP)

09h35  Official welcome and overview of the ALC (Dr Paul Motalane, ALC Manager, CSIR)

10h00  Participants to introduce themselves (all)

10h15  Tea and coffee

10h45  Overview of the SpecUP spectrophotometer (Dr Patricia Forbes)

11h15  Distribution of SpecUP kits to participants and assembly thereof (Chemistry building, Lab 1-24)

12h30  Lunch at Campus Tribecca

13h15  Completion of assembly of kits and development of Prac Manual material in this regard (all)

13h45  Development of experiment and Prac Manual material relating to the Beer Lambert Law, including effects of component adjustment and basic analytical concepts (all)

14h30  Tea and coffee

15h00  Continue with experimental development (all)

15h45  Discussion of progress (all)

16h00  End of Day 1
TUESDAY 19 NOVEMBER

09h00  Arrival at venue (Chemistry building, Lab 1-24)

09h10 Development of experiment and Prac Manual material relating to recording of spectra using the SpecUP, including effects of component adjustment and basic analytical concepts (all)

10h30 Tea and coffee

11h00 Continue with experimental development (all)

11h30 Overview of SpecUP student questionnaires (Dr Patricia Forbes) (Building NW1, Room 2-32 Mendeleev Lecture Room)

12h00 Discussion of questionnaires (all)

12h30 Lunch at Campus Tribecca

13h30 Discussion regarding implementation of the SpecUP (all)

14h30 Tea and coffee

15h00 Workshop and SpecUP evaluation (all)

15h20 Vote of thanks and closing comments (Dr Patricia Forbes)

15h30 End of Day 2
APPENDIX C – FINANCIAL DETAILS

Income:
ALC sponsorship  R60 000

Expenditure:
  1) SpecUP kits  R12 500
  2) Flights  R30 150
  3) Airport transfers  R 2 640
  4) Accommodation  R11 000
  5) Catering  R 1 420
  6) Sundries  R 2 290
      TOTAL  R60 000