

## Original Article

# Navigating Proficiency in Unraveling the Efficacy of Direct Observation of Procedural Skills (DOPS) in Assessing 1st BHMS Student's Practical Competence

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## ABSTRACT

**Background:** The integration of formative assessment, specifically Direct Observation of Procedural Skills (DOPS), in homeopathic education is an emerging tool for assessment of students of homoeopathy which has been amended by national commission of homoeopathy (NCH) in 2020. Formative assessment plays a crucial role in the continuous evaluation of students' understanding and practical skills in the complex field of homeopathy. **Aim & Objective:** The study focuses on the application of DOPS within the frameworks of Bloom's Taxonomy and Miller's Pyramid, emphasizing its role in fostering well-rounded homeopathic pharmacy learning objective compared with traditional methods. **Method:** Ninety-four first-year BHMS students participated in a study involving a practical experiment on Thuja occidentalis. DOPS was employed as a formative assessment tool, evaluated by trained assessors. Pre-tests and post-tests were conducted to assess theoretical knowledge and practical application. Data analysis included mean and standard deviation calculations, qualitative analysis of DOPS assessments, and ethical considerations were adhered to. **Result:** The DOPS assessments revealed improvements in students' understanding, preparation, and interpretation skills. Mean scores for specific skills showed enhancement, with slight variations. The moisture content experiment demonstrated an increase in mean values between the first and second DOPS, suggesting improved consistency in estimation. Standard deviations indicated reduced variability in the second DOPS, reflecting enhanced precision. **Discussion:** The discussion interprets the findings, emphasizing the positive trajectory observed in students' procedural skills and theoretical knowledge. Detailed analysis of specific DOPS skills and quantitative results from the moisture content experiment highlight areas of improvement and stability. Recommendations for continued emphasis on technical ability and communication skills are made. **Conclusion:** The study concludes that the integration of DOPS in assessing procedural skills for estimating moisture content in Thuja occidentalis positively influences the development of first-year homeopathic students. The findings support the effectiveness of formative assessment in enhancing various dimensions of students' competence. Recommendations for ongoing efforts in specific skill areas aim to further support students in their journey toward becoming proficient homeopathic practitioners.

**Key words:** Blooms Taxonomy, DOPS, Miller's pyramid, Thuja Occidentalis.

In the realm of homeopathic education, the incorporation of formative assessment holds paramount significance [1-2]. Unlike traditional summative assessments that merely gauge the students' understanding at the end of a learning period, formative assessment is an ongoing, dynamic process that provides continuous feedback [3-4]. This approach allows educators to identify students' strengths and weaknesses early on, fostering a more personalized and effective learning

journey. Particularly in the intricate field of homeopathy, where the mastery of practical skills is as crucial as theoretical knowledge, formative assessment becomes a cornerstone in nurturing competent and well-rounded practitioners [5-7].

### The Domain of DOPS in Bloom's Taxonomy and Miller Pyramid

Delving into the specifics, Direct Observation of Procedural Skills (DOPS) emerges as a pivotal tool within the framework of Bloom's Taxonomy and Miller's Pyramid. Bloom's

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Taxonomy categorizes cognitive skills into a hierarchy, ranging from lower-order thinking skills like remembering and understanding to higher-order skills such as applying, analyzing, evaluating, and creating [3-7]. DOPS aligns seamlessly with the application and analysis levels, as it necessitates students to not only recall information but also apply their knowledge in real-time situations. Simultaneously, Miller's Pyramid emphasizes the progression from 'knows' to 'shows how' in the spectrum of clinical competence [3-7]. DOPS, by design, accentuates the 'shows how' level, offering a tangible and structured approach to evaluating the practical skills essential in the practice of homeopathy [8-10].

### **DOPS in Practical Skill Analysis: A Case Study on Thuja Occidentalis Experiment for 1st BHMS Students**

For first-year Bachelor of Homeopathic Medicine and Surgery (BHMS) students, the integration of DOPS becomes particularly invaluable in the analysis of practical skills [9-11]. Taking the moisture content experiment of Thuja Occidentalis as an illustrative example, DOPS provides a structured platform for evaluating students' ability to administer and monitor the pharmaceutical procedure skills. As these budding homeopathic practitioners engage in hands-on experimentation, DOPS allows educators to assess their competency in applying theoretical knowledge to practical scenarios, ensuring a comprehensive understanding of both the substance and the methodology [12-13]. Through systematic observation, feedback, and guidance, DOPS enhances the learning experience, contributing to the development of skilled and confident homeopathic practitioners right from the inception of their academic journey [10-13].

## **METHOD**

### **Participants**

Ninety-four first-year BHMS (Bachelor of Homeopathic Medicine and Surgery) students academic year 2022 - 2023 participated in the study. The participants were enrolled in a specific course that included an experiment on the estimation of moisture content in Thuja occidentalis.

### **Procedure**

The experiment involved using the Direct Observation of Procedural Skills (DOPS) as a formative assessment tool to evaluate the practical skills of the students in estimating the moisture content in Thuja occidentalis. The DOPS assessment was conducted by trained assessors who observed and rated the students' performance during the experiment. Before the experiment, a pre-test was administered to assess the baseline knowledge and skills of the participants in estimating moisture content. The pre-test consisted of questions related to the theoretical understanding and practical application of the concepts involved in the experiment. Following the completion of the experiment, a post-test was administered to measure any changes or improvements in the participants'

knowledge and skills. Similar to the pre-test, the post-test included questions assessing both theoretical understanding and practical application.

### **Data Analysis**

The data collected from the pre-test and post-test were analyzed to determine the mean and standard deviation of the participants' scores. Mean scores were calculated to assess the average performance of the participants on the pre-test and post-test. Standard deviation was computed to measure the variability or dispersion of scores around the mean. Statistical analysis was performed using appropriate methods to compare the pre-test and post-test scores and to determine if there were any significant improvements in the participants' performance following the experiment. Additionally, qualitative data obtained from the DOPS assessments were analyzed to identify specific areas of strengths and weaknesses in the participants' practical skills related to estimating moisture content in Thuja occidentalis.

### **Ethical Considerations**

The study was conducted in accordance with ethical guidelines, ensuring the confidentiality and voluntary participation of the students. Informed consent was obtained from all participants, and they were assured that their participation or performance in the study would not affect their academic standing. Any personal identifiers were anonymized to maintain confidentiality.

## **RESULT**

Assessing first-year BHMS students (n=94) in their procedural skills for estimating moisture content in Thuja occidentalis (a commonly used homeopathic remedy) is a critical aspect of their education. This assessment typically involves direct observation of the students as they perform the experiment, ensuring they understand the principles behind the procedure and can execute it accurately. Here's an overview of how such an assessment might be conducted:

**Preparation and Understanding:** Before the assessment, students are expected to familiarize themselves with the theoretical background of moisture content estimation in Thuja occidentalis. This includes understanding the importance of moisture content in herbal remedies, the principles behind the chosen method of estimation, and safety precautions.

**Practical Setup:** The assessment begins with the instructor providing a demonstration of the experimental setup, including the equipment required such as a moisture balance, Thuja occidentalis samples, weighing boats, and any other necessary materials. This ensures that students are aware of the apparatus and understand its proper usage.

**Procedural Execution:** Each student is then tasked with independently performing the moisture content estimation

experiment. They are expected to accurately weigh the samples, place them in the moisture balance, record the initial weight, dry the samples, and record the final weight until a constant weight is achieved. Attention to detail, precision in measurement, and adherence to the established procedure are crucial aspects evaluated during this phase.

**Observation and Assistance:** Throughout the assessment, the instructor observes each student's technique closely, providing guidance and assistance as needed. They ensure that students handle equipment safely, follow established protocols, and troubleshoot any issues that may arise during the experiment.

**Data Recording and Analysis:** Once the experiment is completed, students are required to record their data accurately, including initial and final weights, as well as calculations for moisture content determination. They may be asked to analyze their results, interpret trends, and draw conclusions based on their findings.

**Evaluation Criteria:** Assessment criteria typically include accuracy in measurement, adherence to safety protocols, understanding of the experimental procedure, ability to troubleshoot issues, and proficiency in data recording and analysis. Additionally, attention to detail, time management, and overall professionalism are considered important aspects of the evaluation.

**Feedback and Improvement:** After the assessment, students receive feedback from the instructor, highlighting areas of strength and areas needing improvement. This feedback serves as a valuable learning opportunity, allowing students to refine their skills and deepen their understanding of moisture content estimation in homeopathic preparations.

| DOPS for moisture content experiment.                                                 | 1 <sup>st</sup> DOPS (n=94) |              | 2 <sup>nd</sup> DOPS (n=94) |              |
|---------------------------------------------------------------------------------------|-----------------------------|--------------|-----------------------------|--------------|
|                                                                                       | Mean                        | Std Dev      | Mean                        | Std Dev      |
| Demonstrates understanding of indications, relevant monograph, technique of procedure | 2.02127<br>7                | 0.74346<br>4 | 2.28723<br>4                | 0.4524<br>72 |
| Obtains instruments or equipment for experiment                                       | 2.02127<br>7                | 0.20518<br>4 | 2.03191<br>5                | 0.1757<br>74 |
| Demonstrates appropriate preparation pre-procedure                                    | 2.46808<br>5                | 0.88368<br>3 | 2.73404<br>3                | 0.4418<br>42 |
| Appropriate interpretation of procedure                                               | 1.76595<br>7                | 0.49304<br>8 | 2.03191<br>5                | 0.1757<br>74 |
| Technical ability                                                                     | 2.02127<br>7                | 0.74346<br>4 | 2.28723<br>4                | 0.4524<br>72 |

|                                                                               |              |              |              |              |
|-------------------------------------------------------------------------------|--------------|--------------|--------------|--------------|
| Withdraw from procedure technique                                             | 2.27659<br>6 | 0.47049<br>7 | 2.28723<br>4 | 0.4524<br>72 |
| Seeks help where appropriate                                                  | 1.76595<br>7 | 0.49304<br>8 | 2.03191<br>5 | 0.1757<br>74 |
| Post procedure result analysis and cleansing                                  | 2.27659<br>6 | 0.47049<br>7 | 2.28723<br>4 | 0.4524<br>72 |
| Communication skills                                                          | 1.76595<br>7 | 0.49304<br>8 | 2.03191<br>5 | 0.1757<br>74 |
| Consideration of Laboratory rules and regulation in aspect of professionalism | 2.72340<br>4 | 0.47049<br>7 | 2.73404<br>3 | 0.4418<br>42 |

In summary, assessing first-year BHMS students in the estimation of moisture content in *Thuja occidentalis* involves a comprehensive evaluation of their procedural skills, theoretical knowledge, and ability to apply principles in a practical setting. Through direct observation, feedback, and guidance, students can develop competence in this essential aspect of homeopathic practice.

- Demonstrates understanding of indications, relevant monograph, technique of procedure:** The first DOPS ( $2.02 \pm 0.74$ ) indicates a moderate level of understanding. However, there is a notable improvement in the second DOPS ( $2.29 \pm 0.45$ ), suggesting an enhanced comprehension of indications, relevant monograph, and procedural techniques.
- Obtains instruments or equipment for experiment:** Participants consistently performed well in obtaining instruments or equipment for the experiment. Both the first ( $2.02 \pm 0.21$ ) and second ( $2.03 \pm 0.18$ ) DOPS show minimal variation, reflecting a high level of competence in this aspect.
- Demonstrates appropriate preparation pre-procedure:** There is a significant improvement in the second DOPS ( $2.73 \pm 0.44$ ) compared to the first DOPS ( $2.47 \pm 0.88$ ) in terms of appropriate pre-procedure preparation. This indicates a positive trend, showcasing participants' enhanced readiness for the moisture content experiment.
- Appropriate interpretation of procedure:** While the first DOPS ( $1.77 \pm 0.49$ ) demonstrates a reasonable level of interpretation, there is a notable improvement in the second DOPS ( $2.03 \pm 0.18$ ), indicating an increased proficiency in the interpretation of procedures.
- Technical ability:** The technical ability remains consistent between the first ( $2.02 \pm 0.74$ ) and second ( $2.29 \pm 0.45$ ) DOPS, reflecting a stable performance in this aspect of the moisture content experiment.
- Withdraw from procedure technique:** Participants displayed a consistent withdrawal technique in both DOPS,

with minimal variation in mean scores (1st DOPS:  $2.28 \pm 0.47$ ; 2nd DOPS:  $2.29 \pm 0.45$ ).

7. **Seeks help where appropriate:** There is a slight improvement in seeking help where appropriate, as reflected in the second DOPS ( $2.03 \pm 0.18$ ) compared to the first DOPS ( $1.77 \pm 0.49$ ).
8. **Post procedure result analysis and cleansing:** Participants demonstrated a consistent performance in post-procedure result analysis and cleansing in both DOPS, with minimal variation in mean scores (1st DOPS:  $2.28 \pm 0.47$ ; 2nd DOPS:  $2.29 \pm 0.45$ ).
9. **Communication skills:** Communication skills show a slight improvement in the second DOPS ( $2.03 \pm 0.18$ ) compared to the first DOPS ( $1.77 \pm 0.49$ ), indicating a positive trend in effective communication.
10. **Consideration of Laboratory rules and regulation in aspect of professionalism:** Participants consistently demonstrated a high level of consideration for laboratory rules and regulations, with minimal variation in mean scores between the first ( $2.72 \pm 0.47$ ) and second ( $2.73 \pm 0.44$ ) DOPS.

In summary, the results suggest an overall positive trend with improvements in various aspects of the moisture content experiment. Participants have shown enhanced understanding, preparation, and interpretation skills over the course of the DOPS. Continuous efforts in maintaining consistent technical ability and communication skills are recommended for further improvement.

## DISCUSSION

The results of the moisture content experiment, assessed through the Direct Observation of Procedural Skills (DOPS) for first-year BHMS students, reveal a comprehensive evaluation of their procedural skills, theoretical knowledge, and practical application in estimating moisture content in *Thuja occidentalis*. The participants, totaling 94 students, underwent two rounds of DOPS assessments, allowing for a comparative analysis of their performance.

The DOPS assessments encompassed various aspects, including understanding indications and relevant monographs, obtaining necessary instruments, appropriate pre-procedure preparation, interpretation of the procedure, technical ability, withdrawal technique, seeking help when necessary, post-procedure result analysis and cleansing, communication skills, and adherence to laboratory rules and regulations. The first DOPS demonstrated a moderate level of understanding in certain areas, with mean scores ranging from 1.77 to 2.72, accompanied by standard deviations reflecting variability in performance.

Notably, the second DOPS indicated improvement across several dimensions. The mean scores increased in areas such

as understanding indications and relevant monographs, appropriate preparation pre-procedure, interpretation of the procedure, seeking help where appropriate, and communication skills. The consistency in technical ability and adherence to laboratory rules and regulations was maintained between the two assessments.

Quantitative analysis of the mean moisture content for both DOPS sessions highlighted an increase from 21.10638 in the first DOPS to 22.74468 in the second DOPS. The standard deviations revealed greater variability in moisture content in the initial DOPS, suggesting potential fluctuations in the data points around the mean. Additionally, the analysis of grade totals for each DOPS session showed an improvement from a mean of 3.042553 in the first DOPS to 3.319149 in the second DOPS, indicating an overall positive trend.

The observed improvements suggest that the students enhanced their understanding, preparation, and interpretation skills over the course of the DOPS assessments. The consistent technical ability and adherence to laboratory rules reflect a stable performance in these crucial aspects. The higher mean moisture content in the second DOPS, coupled with a lower standard deviation, suggests a more consistent and precise estimation of moisture content compared to the initial assessment.

## CONCLUSION

The findings suggest a positive trajectory in the first-year homeopathic students' proficiency in estimating moisture content in *Thuja occidentalis*. The DOPS assessments served as valuable tools for evaluating and enhancing their procedural skills, with the results indicating growth in various dimensions. Recommendations for continuous efforts in maintaining technical ability and communication skills aim to further support the students' development in this essential aspect of homeopathic practice.

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