

# M&M WHEELS: A FUN LEARNING TOOL FOR NOMENCLATURE AND CLASSIFICATION OF AMINES

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## ABSTRACT

This study involved 18 students from a practicum group (S1FP3) in Negeri Sembilan Matriculation College. A pre-test and brief interviews found these students encountered difficulties in classifying, naming and drawing the structures of primary, secondary and tertiary (1<sup>o</sup>, 2<sup>o</sup>, 3<sup>o</sup>) amines. They also failed to differentiate between the aliphatic and aromatic amines. Therefore, an innovative learning tool known as M&M (Mix and Match) Wheels was developed by “Chem Riders” to address the above problems. Using M&M Wheels, students were able to engage in small group activities involving constructing and naming various structures of 1<sup>o</sup>, 2<sup>o</sup> and 3<sup>o</sup> amines. M&M Wheels also utilized QR codes that are linked to examples of 1<sup>o</sup>, 2<sup>o</sup> and 3<sup>o</sup> aliphatic and aromatic amines for students’ reference. A post-test was conducted to evaluate students’ achievement after using M&M Wheels. Data analysis showed a significant improvement in students’ score for the post-test (mean score = 9.78) compared to pre-test (mean score = 6.56). Students also showed positive views towards the usage of the learning tool in M&M Wheels Questionnaire. In conclusion, this study found that M&M Wheels facilitated learning in a fun, interactive and meaningful way besides serving as a tool for developing students’ social skills. It is also an effective formative assessment tool for learning “Nomenclature and Classifications of Amines”.

**Keywords:** M&M wheels, learning tool, nomenclature and classification of amines

## 1. INTRODUCTION AND OBJECTIVE

In the Matriculation Programme, all science students need to learn the topic “Amines” according to Curriculum Specification of *Chemistry 2 SK025* [1]. Amines are organic compounds formed by replacing one or more hydrogen atoms of ammonia with alkyl or aryl groups [2]. Despite the lessons having been taught in lectures and tutorials, students generally encountered difficulties in learning “Nomenclature and Classification of Amines”. *M&M (Mix and Match) Wheels* was developed by the Chem Riders from Negeri Sembilan Matriculation College (KMNS) to engage students in fun and interactive learning of “Nomenclature and Classification of Amines”. This learning tool consists of three wheels joined together at the centre shown in Figure 1. The back of the third wheel consists of general structures of 1<sup>o</sup>, 2<sup>o</sup> and 3<sup>o</sup> amines and QR codes that are linked to specific examples. By spinning the wheels to mix and match the atoms or groups of atoms, a total of 18 structures of 1<sup>o</sup>, 2<sup>o</sup> and 3<sup>o</sup> amines can be constructed.



**Figure 1.** Front and Back View of *M&M Wheels* (LY2020000926)

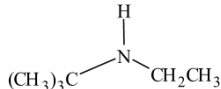
The specific objectives of *M&M* are to guide students:

1. to classify different classes of amines (1°, 2° and 3°).
2. to differentiate between aliphatic and aromatic amines.
3. to draw the structure and name aliphatic or aromatic amines according to the

## 2. METHOD

A study was carried out on 18 KMNS students from practicum S1FP3. Using *M&M Wheels*, students were able to engage in small group activity involving constructing and naming various structures of 1o, 2o and 3 amines. Worksheets were provided for them to fill in their answers. Table 1 shows an example of the structures. Students were then instructed to scan the QR code which linked to answers. Students were able to check their answers and do corrections accordingly.

Table 1. Molecular Structure, Classes of Amines and IUPAC name

| Classes             | Structure   | IUPAC NAME                             |
|---------------------|---|--|
| 2° aliphatic amines |  | <i>N</i> -ethyl-2-methyl-2-propanamine |

A post-test similar to pre-test was used to determine students' achievement level after using *M&M Wheels*. The pre-test and post-test consisted of 10 structured questions carrying 10 marks. Short interviews and *M&M Wheels* Questionnaire were used to gauge students' view on the usage of the learning tool. It comprised 6 *five-point Likert Scale* items.

## 3. RESULTS AND DISCUSSION

Data analysis shows the usage of *M&M Wheels* has significantly improved students' understanding of concepts regarding "Nomenclature and Classification of Amines". All S1FP3 students showed an increase in the post-test score (mean = 9.78) compared to the pretest score (mean = 6.56). Two students of the pre-test's bottom five students scored a full score of 10.00. In addition, the answer scripts showed that all the 18 students were able to classify the amines 100% correctly, while 14 out of 18 were able to state the IUPAC names 100 % correctly.

The findings of *M&M Wheels* Questionnaire showed that all items in the questionnaire have a mean score above 4.00, indicating that students had positive views towards the usage of this learning tool. The students generally perceived that *M&M Wheels* were suitable for use in group activity in tutorial class as it effectively enhanced their concepts on "Nomenclature and Classification of Amines". The students also responded that they were having fun using *M&M Wheels* and it sparked their interest in learning. Some feedback collected from students in short interviews are as follows:

"I am able to rectify my misconception immediately"

"Activity using such learning tools should be carried out for other lessons"

From our observation throughout the study, it was also found that *M&M Wheels* successfully enhanced students' social skills and self-confidence through their active engagement in the activity.

#### **4. CONCLUSION**

M&M Wheels facilitated learning in a fun, interactive and meaningful way besides serving as a tool for developing students' social skills. It is also an effective formative assessment tool for learning "Nomenclature and Classifications of Amines".

#### **REFERENCES**

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