Novelty Journals

ISSN 2394-9686

International Journal of Novel Research in Education and Learning
Vol. 7, Issue 2, pp: (35-39), Month: March - April 2020, Available at: www.noveltyjournals.com

Teaching Sub-Atomic Particles in Chemistry with a Song

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Abstract: **The need to use varieties of different strategies in teaching during lessons calls for a continuous exploration of those strategies in relation to topics in the syllabus. Since music cuts across all cultures, it has also became a tool in promoting the understanding of science concepts. In view of that this study sought to explore the use of a song in teaching Sub-atomic particles in chemistry among pre-service teachers. The student-teachers were made to learn a song with the lyrics re-written with information from the sub-atomic particles in chemistry. In groups, they answered questions based on the contents of the content-rich song. The lesson had the visual and verbal activities including group -based learning. After a year, the student-teachers who had learnt the lesson were still singing the song which meant that they still remembered the concept they had learnt.**

Keywords: **music, Sub-atomic particles, teaching, chemistry.**

1. INTRODUCTION

Apart from engaging learners in meaningful activities during the teaching and learning process, there is the need to use different teaching strategies in order to cater learners with different learning styles(Richard, 2016)

One of the ways learners can acquire or review knowledge is through music, which is a vital and powerful tool in teaching and learning (Hospital, 2016) and it is said to be a universal language because people can comprehend it (Starr, 2019) Using music to teach in the classroom promotes the retention of what is learnt, reduces stress and caters for different learning styles. Learners also enjoy lessons when music is also used as a teaching and learning tool (Jam Campus Education, 2019, T-TEL PD Guide for tutors, 2015) In the basic level, there are songs that are used to achieve specific learning outcomes but it is quite a challenge using songs to teach student-teachers at the college of education (T-TEL PD Guide for tutors, 2015) Songs on scientific concepts made by students of some selected universities and High schools were so elaborate and had so much information to be digested at a time. Some of them had to perform or sing their songs on the last day of school but there is the need for pre-service teachers to prepare and use songs on scientific concepts, in their own context, which contain a bit of information at a time, to learn for themselves and use them to teach the pupils in the lower levels. In view of that, this paper explores the use of a song to teach the Sub-atomic particles in chemistry.

2. METHOD

A content-rich song was prepared by the author using a common song well known by most of the student teachers. The lyrics of the song were changed to suit the purpose at hand. A common song was chosen to enable the student-teachers learn the song within the shortest possible time during a lesson on the topic.

i) The student teachers(30 in number) were also asked to read around the topic in advance.

ii) In groups they discussed the information they have gathered in class

iii) They were introduced to the song and the student teachers sang and danced to the song.

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iii) In groups they had a discussion among themselves and brought out the information presented in the song.

iv) Still working in groups, the student-teachers answered questions based on the information presented in the song on the sub-atomic particles.

v) They were able to consult books and the internet for a more detailed explanation of the information in the song.

The sub-atomic particles song

In neutral atom lec qua protons

And the mass number is Z + N

Lec negative one

Pro pro positive one 2X

And the iso same ato mass diff.

Lec - electrons

qua - equals

Pro - Protons

iso - isotopes

Ato - Atomic

Information presented in the song

i) In a neutral atom, the number of electrons is equal to the number of protons.

ii) The mass number (A) is the sum of the number of protons (atomic number, Z) and the number of neutrons (N).

iii) The charge on one electron is negative one.

iv) The charge on one proton is positive one.

v) Isotopes are atoms of the same elements which have the same atomic number but different mass numbers.

The musical notes(pitches) for the song is written below:

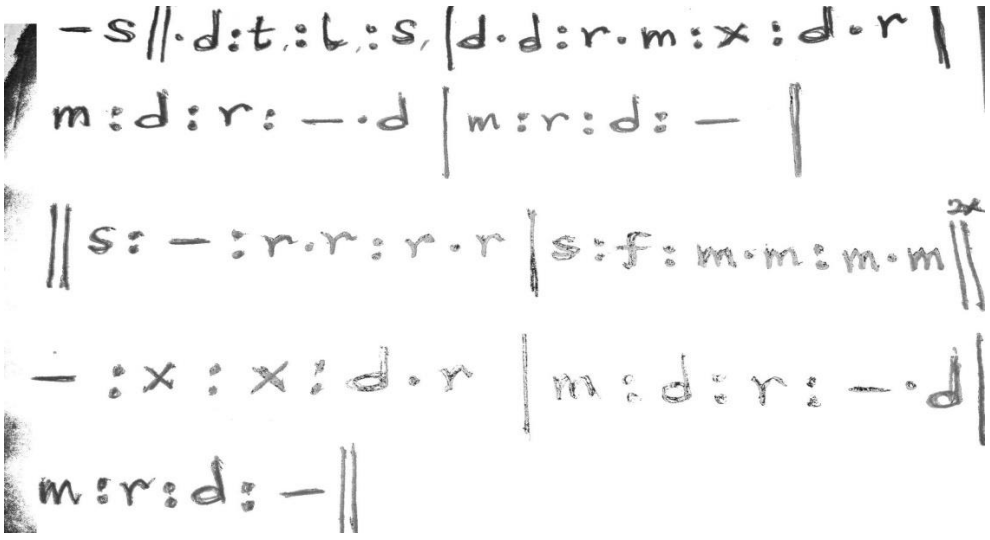

Figure 1: musical notes for the song

The musical notes together with the words of the song helped the tutor to quickly rewrite and teach the song but since it was a popular song among the pre-service teachers, it was much easier to teach the song even without the pitches.

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The musical notes together with the words of the song is also shown below:

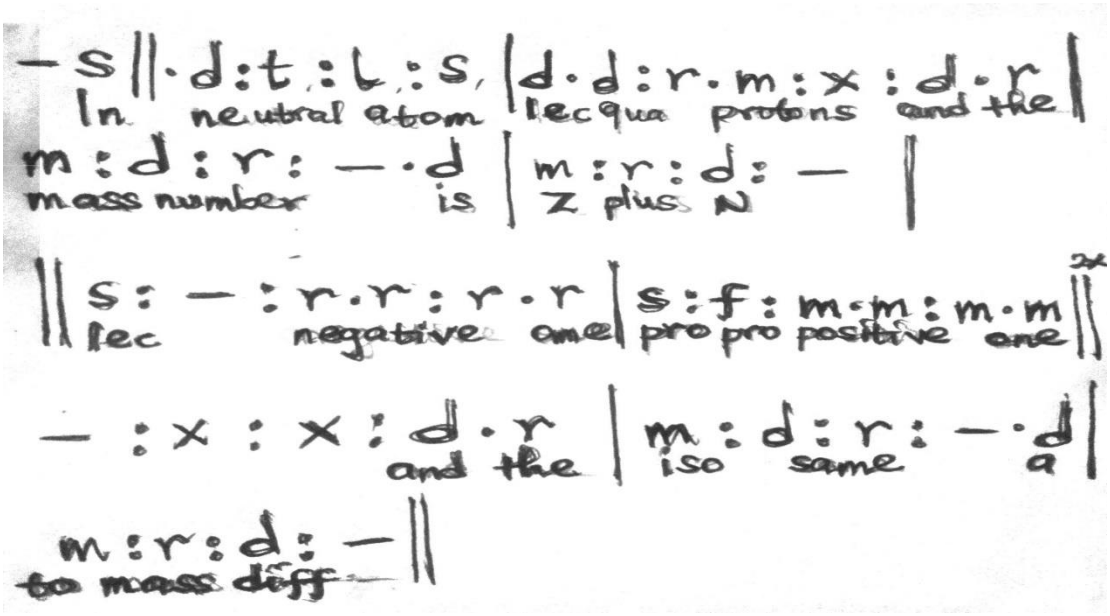

Figure 2: Musical notes with words for the song

The questions answered by the student-teachers after the discussion were as follows;

1) An atom has 6 protons and 7 neutrons in its nucleus. Find the mass number and the number of electrons.

2) Fill in the blank spaces in the table below:

Particle	Mass number	No. of Protons	No. of Neutrons	No. of Electrons
Al^{3+}	27	13	……..	……
Al	……..	……..	……..	……
N^{3-}	14	7	…….	……

3) For the atom $_{19}{}^{39}K$,

i) State the number of electrons present

ii) How many protons are present?

iii) How many neutrons are present?

4) For the cation $_{19}{}^{39}K^{+1}$,

i) State the number of electrons present.

ii) How many protons are present?

iii) How many neutrons are present?

5) Use the table below to answer the questions that follow.

Particle	Mass number	Atomic number
A	2	1
B	3	1
C	3	2
D	6	3
E	9	4
F	11	5

i) Which atoms are isotopes of the same element?

ii) Why are they called isotopes?

iii) What accounts for the differences in their mass numbers?

Answers to the questions above

1) Since the number of protons is the same as the atomic number (Z), then Z is 6.

The number of neutrons has been given as 7.

Using the formula A= Z+ N,

The mass number (A) is given as A = 6 + 7 = 13

For the number of electrons, since the atom in the question is neutral, the number of electrons is equal to the number of protons. Therefore, the number of electrons is 6

2)

Particle	Mass number	No. of Protons	No. of Neutrons	No. of Electrons
Al^{3+}	27	13	…14….	…10..
Al	…27…	…13…	…14….	…13..
N^{3-}	14	7	…7…	…10…

With this question, students get to re-enforce their knowledge that a neutral atom has the same number for both electrons and protons. Nonetheless, the charged ones (that is either an anion or cation) have the number of protons different from the number of electrons.

3). This question requires the students to identify the mass number and the atomic number from the given atom. They also had the opportunity to use the formula for finding the mass number.

From $_{19}^{39}K$, i) the number of electrons is 19.

ii) The number of protons is 19.

iii) The number of neutrons is 20

4) The difference between this question and that of the previous one is that the number of electrons will now become 18, since one electron has been given out and the atom has now become charged (cation).

5)

Particle	Mass number	Atomic number
A	2	1
B	3	1
C	3	2
D	6	3
E	9	4
F	11	5

i) Out of the particles A to F , atoms A and B are isotopes of the same element.

ii) They are called isotopes because they have the same atomic number but different mass numbers.

iii) The difference in mass numbers is due to the difference in the number of neutrons.

3. DISCUSSIONS

Using a song to teach the sub-atomic particles provided a different learning experience for the student-teachers. They enjoyed themselves by dancing to the song and consulting among themselves to verify the contents of the song. After a year, the student –teachers who were part of the class were still singing the song on the sub-atomic particles. This is in line with the notion that learners remember about 90% of what they learn when participatory techniques are used in lessons. (MOE, 2010)

Since the student-teachers were working In groups, collaborating and sharing ideals with one another as part of the learning process for that particular lesson, they all answered the questions correctly. In the near future the author intends to prepare another song on a different topic and collect data using pre and post text.

4. CONCLUSION

Since music is a vital strategy in the teaching and learning process which is used for building comprehension of scientific concepts, memory and the recall of what is learnt, student-teachers should be encouraged to prepare scientific content-rich songs both for themselves and the younger learners they would be teaching.

ACKNOWLEDGEMENT

The author would like to thank Dr. Asare, my husband for imensely supporting this work with the needed resources. It is also worth thanking Mr Ethelbert Twumasi, a music tutor for providing the musical notes used in this work.

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