

Academic Literacy Practices in Science domain: The case of Yemen

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ABSTRACT

This article discusses the findings of a study that identifies academic literacy practices of Yemeni students studying science at the Faculty of Science, Sana'a University, Yemen in response to a need for improving the practices of science among Yemeni students. Academic literacy practices refer to the reading, writing, speaking and listening. Data was collected through interviews and observation checklists. The interview data was transcribed, organized, coded, categorized, and analyzed. The findings of the study indicate that students tend to have difficulties in literacy practices in terms of asking questions in science classrooms. The findings also revealed that the content of science textbooks are shallow, out-fashioned, poor and non-schematic drawings, and lack of reference.

Keywords: academic literacies, literacy practices, science learning, science education, scientific literacy, Yemen, National Science Education Standards.

INTRODUCTION

Science is being taught and learned in Yemen as it is being used for nation building purposes. Yemen embraces science like other nations in order to advance and be competitive. According to the National Research Council –NRC (2005) derived from *Academy Sciences* journal regarding the National Science Education Standards, products of that required scientific inquiry and scientific literacy are proliferating the lives of people in this era. It has become a necessity to master these skills and in order to do so, Yemen needs to relook at the methodology of learning and teaching as the needs of science discipline is different from the normal disciplines. More and more jobs are demanding scientific literacy skills as they need advanced skills with the ability to learn, reason, think creatively, solve problems and make decisions. Science has become the main concern of developed and developing countries including Yemen. Yemen faces problems in inadequate innovative thinkers, creativity, and innovation in the scientific field. These could hamper the progress of science education and other development programs that Yemen wish to pursue. Science was and is taught merely for pedagogical purposes. Basic knowledge and students' ability of comprehending of scientific knowledge are found to be not satisfactory.

Looking at the National Science Education Standards, the basic tenets are to be guided by four principles, which are: 1) Science is for all 2) Learning science is an active process 3) School of science reflects the intellectual and cultural traditions that characterise the practice of contemporary science and 4) Improving science education is part of systemic education reform.

In Yemen, science education starts at an early stage. It is a compulsory subject up to the age of 16. However, science education is not included at kindergarten level; children engage in simple activities only and continue this way until the third year (ages 4-9). In this early period there is no science as such, but the scientific aspects of several activities are emphasised indirectly. At present, science education is facing a rapidly expanding school system, a critical shortage of trained teachers, as well as a lack of materials and facilities at the level of school and universities.

In Yemen, Science and mathematics education is similar to other developing countries: “schools have large classes, few resources, dominant teachers, whole class teaching, and focus on factual information rather than knowledge with understanding, despite the efforts by the Ministry of Education to change the curriculum, including a more active approach to teaching and learning” (Centre for International Cooperation, 2012).

A study done by Mahyoub (1996) confirmed that research on science students in Yemen is still in its infancy, because of lack of researches, resources and funds. The rate of the weakness in science among Yemeni science students is somewhat high; their ability to comprehend scientific knowledge is not satisfactory

ACADEMIC LITERACIES

When discussing the definition of academic literacy, Schalkwyk in (2008:7-8) attested to the “complexity of the phenomenon” and it could be mooted that the two-word nature of the term adds to this complexity. The adjective “academic” is “relating to education, especially at college or university level” (Longman Dictionary of Contemporary English 2004:7) whereas the term “literacy” related to as “a student’s capacity to use written language to perform those functions required by the culture in ways and at a level judged to be acceptable by the reader” Ballard and Clanchy (1988:8 cited in Schalkwyk, 2008). Gee, (2003) elaborated more on the term literacy, he defined it reading and writing. According to Cheng (2013:12) “Acquiring academic literacy is a complex activity” (Cheng, 2013). It is a challenge for non-native speakers and it is not intuitive to native speakers of English because of their possible lack of linguistic, social, cultural, and discursive knowledge of the discipline. Furthermore, Lillis and Scott (2008) in their position paper illustrated that “one of the main goals of Academic Literacies is to problematize the definition and articulation of perceived ‘problems’ in student writing (Coffin and Donohue, 2012)”. Whereas literacy practices are a primary object of study in Academic Literacies. According to Coffin and Donohue (2012:65) In Academic Literacies, “literacy practices are both individual behaviours that participants display in a literacy event and complex and abstract social phenomena which include the larger social and cultural meanings that participants bring to, and deploy, in their participation in a literacy event”.

From another perspective academic literacy practices can be defined as the reading, writing, speaking, listening and thinking skills, dispositions, and habits of mind that students need for academic success. At the same time, it includes the ability to critically read and interpret a wide range of texts, to write competently in scholarly genres, and to engage in and contribute to sophisticated academic discussion (Intersegmental Committee of the Academic Senates 2004:525). This is in line with the Knowledge Framework that requires students to have the ability to think critically and be able to interpret data and scientific information (Scientific inquiry).

Therefore, academic literacy practices cover the four skills which are reading, writing, speaking, listening and thinking. It is believed that through reading, we can identify the way learners deal and interact with their science subject, such skills allow us to recognize to what extent learners understand science texts and what type of learning they prefer to use while they interact with science subject. The expression of reading in a science text, its relation to other disciplines is different. Science has a language of its own that prescribes a certain way of looking at the world, (Derewianka 2003:253).

According to the National Science Education Standards, scientific literacy is ‘the knowledge and understanding of scientific concepts and processes for decision making, participation in civic and cultural affairs, and economic productivity.’(1996:6). Scientific literacy signifies that a person questions and inquires means or determines answers to questions derived from

inquiries in their daily lives. It involves the ability to describe, explain, and predict natural phenomena. It requires a person to be able to read, understand and decipher scientific articles and data, and be able to question and seek validity of the scientific conclusions.

A person with science literacy will be able to evaluate the quality of scientific information, the reliability of its source, and the methods and methodology. It also involves the capability to pose and evaluate arguments based on evidence and apply them to a viable conclusion. (National Research Council (1996:22).

The main goal of science education is achieving scientific literacy as it has been frequently highlighted in National Research Council {NRC} (1996). Scientific literacy is multidimensional and comes in a variety of types and degrees.

CONTEXT OF THE STUDY

The findings discussed in this paper is part of a doctoral study that seeks to investigate the ways undergraduate science students experience and respond to literacy practices in Arabic language in learning science. In particular, the study seeks to explain the ways academic literacy practice is used at the Faculty of Science. There are six departments at the Faculty of Science: Chemistry, Earth and Environment, Biology, Physics, Mathematics and Computer, Integrated Oceanography and the Environment. Biology department is one of the first division established at the science college at Sana'a University and it is the first biological science division in Yemen as a whole.

This faculty has been chosen due to the rate of the weakness in science among Yemeni science students and their inability of comprehending science based material (Mahiyoub 1996). Also this faculty was the first to be established in Yemen in 1974. It is one of the biggest and most crowded faculties at the University of Sana'a. Faculty of Science has been chosen to be the context for this study due to the fact that studying in this faculty is almost entirely in Arabic language. Arabic language has been the medium of instruction in most of the Yemeni universities.

The University of Sana'a itself was supported by the State of Kuwait at the beginning of 1974 till 1990. Initially the teaching board members were executed through the State of Kuwait and for this period there was no Yemeni cadre. The Kuwait government financed colleges, furnished them with libraries, books, tools, stationeries, glasses, chemical materials and buildings. There was tremendous advancement in the past but after the Gulf War, things soured and the Kuwait government withdrew its support for Yemen's Faculty of Science, as a result things started to deteriorate gradually.

METHODOLOGY

The participants were second and fourth year Biology students at the Faculty of Science, Sana'a University, Yemen. This faculty was the first to be established in Yemen in 1974. It is one of the biggest and most crowded faculties at the University of Sana'a, and it comprises six areas of specializations: mathematics, physics, computer science, chemistry, biology and geology. Participants were made up of 16 males and 10 females from the biology division which is divided into three specializations: Botany, Zoology, and Microbiology. Level two and four students were considered most suitable for the study because these two levels are called "general study" students, whereas level three students specialized in Botany, Microbiology or Zoology. The students' ages ranged from 18-25 years.

The primary means of data collection used was open-ended interview and classroom observation checklist. There were six questions used in the interview (Appendix A). There were 26 students interviewed lasted between 20 minutes to 40 minutes. The interview was conducted in Arabic Language to make sure that students understand the interview questions as teaching and learning of science is in Arabic Language. The interview data was transcribed, organized, coded, categorized, and analyzed. The coding procedures as is to pull the data together to present concepts and themes regarding the data. The students names were not used in this study; numbers used instead.

Classroom observation checklist designed to provide additional supportive data to the interview. There were twelve main categories in the observation checklist: science classroom, science class lesson, teachers' attitudes towards teaching science, and science lesson atmosphere. The observation checklist was made by the researchers based on the requirements of the study (Appendix B). Data from the classroom observation checklists was also analyzed.

FINDINGS AND DISCUSSION

The findings of this study discussed six significant themes related to the academic literacy practices in the science domain among science participants in this study.

- i. Science learning for the students' future carriers
- ii. Sana'a University support for science Learning
- iii. The use of bilingual practices as a learning resources
- iv. Science textbook
- v. Lectures roles in learning
- vi. Role of questioning in the learning of science

Science learning for the students' future carriers

Comments gathered from the students' interview data found that majority of the students emphasized that science is important for their futures' carrier. It can be safely conclude that majority of the respondents believe that science is important for their future carrier and this showed that there are positive attitudes towards learning science. This is supported with the following quotations:

Extract 1

"I think so, it is certainly important and beneficial but they are not the promising benefits we thought to find in the college but there is a benefit, since it is unreasonable to study 4 years and graduate in vain, but one can promote himself by enrolling in courses after the university"- Student (20).

"Sure...means for everything there is a reason... Sobhan Allah science is available in the human's life, I just feel that science is in the psychology and in Medicine study and in the Arts study...even in the practical work it makes everything interesting, it makes the human understand life and the environment and discover the existence of things...scientific things..."-student (2).

Sana'a University support for science learning

The findings reveal that Sana'a University management failed to support and provide conducive environment for science learning. Students believed that Sana'a University has a negative attitude towards supporting the Faculty of Science. This is supported with the following citations:

Extract 2

"Frankly, I do not see any encouragement ... they made the curriculum we are studying and that is ... nothing encouraging" - student(20)

" "yes, but they are not enough, they only take care of the university shape ...but there is a lot of shortage" - student(4)

"not much.....I mean in the university don't concern about science...the most negligible Faculty is the science.....even the whole society never care of Science Faculty"- student (18) "No, the university deteriorating i.e. in the seventies it was better than now, many telling this"- student 22.

The use of bilingual practices as learning resources

The findings reveal that students receive scientific contents first in the English language. They then proceeded from this to sometimes learn science in Arabic. In learning science, students learn science from the translated materials by their professors who translated the English science textbook into Arabic and this is actually not good enough for science students to learn science because the knowledge is limited by the translated text. Learning science should be much more dynamic in order to produce students who are innovative thinkers.

In Yemen, the general public and lower to middle class societies do not possess the necessary knowledge and skills at speaking English language. If there are individuals who possess this knowledge, they usually come from the elite or

upper class families who have the means to better education, whether locally in Yemen or abroad. Thus for the general public, some of the teachers utilised the Arabic language in their teaching of science at the tertiary level by translating the science input from textbooks or other sources explained in English into Arabic, or from Arabic into English. This can be seen in the excerpt below:

Extract 3

"I strongly agreed...it is necessary because English Language is the language of modern world, especially in the scientific aspect"- student 12.

"I agreed but not from level three. It will be a shock for a student,...as he just graduated from the secondary school, and the English language subject in the secondary school in Yemen is very weak....therefore, if teaching in English language from the first year, we will get used to

...as a result, it will be easy for the students"- student 17.

According to Ovando et al. (2003) the first language can be used to teach Mathematics and Science for English language learners who have not reached the appropriate academic language proficiency to be able to learn science completely in English. Cummins (1984:143) in his analysis of research in bilingual education suggested that first language (L1) and second language (L2) academic proficiencies are interdependent. Although, languages are separated at the surface level of function and communication, "there is an underlying cognitive/academic proficiency that is common across languages." Cummins emphasized that education in L1 provides the learner with specific subject matter information that can be transferred to second language learning and this makes learning in the second language easier. This means that Arabic language is indeed relevant as it can help students to acquire scientific conceptual understanding which can be transferred when learning the science curriculum in English.

The findings showed that the proficiency of science students in English is low and weak as the medium of instruction in the Yemeni schools and universities is the Arabic Language. Yemeni students are only exposed to English at the age of 12 years, which hinders their exposure to the language. Though they study English as a subject in schools but they seldom use it in their daily life. The culture itself does not encourage using English in academic or social situations. The culture favours and values highly the Arabic language which is relatively religious. The Arabic language is well-known in the Arabic culture as the languages of Quran and the Haven ((Encyclopedi). The people feel the pride to speak it and never relegate the same status to any other language. This in turn affects and impacts upon their attitude towards other languages. Though they admitted the importance of English, but they never consider English language more prestigious than Arabic. However, it has been found that students prefer to learn English and use it in academic situation because they believe that using English would help them to enhance a good access to academic subjects. Therefore there arises a paradoxical situation of the old world culture of the Yemeni people and the changing attitudes and perceptions of the younger Yemeni generation Yemeni towards the utilization of the English language as a medium to access knowledge, in this instance – scientific knowledge. It could be seen that there is a transition in the values and culture of the Yemeni younger generation.

Science textbook

The findings of the study emphasized that the science textbooks is an old epistemic and shallow content which need evolvement. Based on the classroom observation, a comparison was done between the science textbook with the National Science Content Standards, it is found that the science textbooks focused more on the scientific facts whereas the National Science Content Standards focused on scientific knowledge to solve every day problem. The findings showed that there isn't enough attention to the development of the creativity and imagination of the students by the concerned authority. Moreover, the science curriculum should not only focus on helping students to know scientific facts but should also assist students to apply scientific knowledge to solve everyday problem (Nashwan 2003:3). Students' views regarding science textbook can be seen in the excerpts below:

Extract 4

“Normally our curriculums are books in the library, we print from it, sometimes when you read it, you do not feel it is for someone learning i.e. it is an educational book only and I am constraint to memorize it just for the examination”-student 5.

“Some teachers explain the scientific subject explicitly but when we returned home, we just feel that the explanation is something and what is in the scientific subject is something else”-student 10.

“as for the scientific subject it is out-of date and there is only some modern books access currently-student 9.

Lectures roles in learning

The findings of the study reveal that students are not satisfied with the teachers input. The data is supported by students' interviews excerpts where student 3 mentioned that “Some teachers just to read from the handouts...that is way we don't understand, unless you review yourself from the handout”. Student 15 stated that “Some teachers just talk and talk...teachers should know how to convey the information to the students in a good way”- student 15. This is also mirrored in the classroom observation where the first set of teachers' actions was a fairly “traditional” formal explanation of science subject points, either in Arabic or in English. This finding is in agreement with what Cortazzi and Jin (1996) has found in this regard. Cortazzi and Jin (1996) found that students believe that teachers should have profound knowledge, ‘very learned’, and ‘should be able to answer all sorts of questions’.

The researcher observed that teachers' actions were not always carried out in a particularly accomplished pedagogical way. For example, some teachers spoke in a fairly inaudible manner, so that only the front few rows could hear clearly what the teacher was saying. Furthermore, the learner group as a whole seemed not to have a very clear overview of what specific aims there were. Few students had a copy of the textbook from which the teacher was working, and the teachers seemed fairly unconcerned about the fact that students were coming and going in a rather chaotic manner. Also, attention levels fluctuated dramatically from one part of the lesson to another.

The researcher pointed out that some teachers were able to retain students' attention, but the general impression the researcher got was the lack of basic pedagogical and classroom management skills such as voice projection or the ability to monitor and retain students' attention by the teachers. In pedagogical terms, the teachers' actions, therefore, were not very appropriate or even accomplished. The following are some other excerpts by the science students towards their science lecturers:

Extract 5

“Means as if he is doing a role and went out, but this affects us, all time wastage illicitly. Practically the Doctors teaching the subject have no specialization. This in Sana'a University i.e. some of them transmit the information properly and you enjoy with them and some of them nothing”- student 16.

“Some teachers for example can convey the information but some for example in the presentation method you do not understand a thing unless you

review yourself from the handouts or the paper” - student 3.

“quite few of them have excellent method i.e. they do not restrict science in a specific field, they expand in things”-student 2.

“It is insufficient but they are dedicating enough effort.

The role of questioning in the learning of science

The findings reveal that students feel shy to ask questions in science classrooms especially female students. The students are very conscious that they do not ask questions. Based on the classroom observation, the researcher found out possible reasons why science students do not ask questions in the science classrooms. The most common reasons given for not asking questions are that Yemeni students are too shy as can be substantiated from the observations by the researcher and from video recordings of science class sessions. This response can be linked to other major reasons: other students may laugh and they are afraid of making mistakes. A common factor behind these reasons is ‘face’;

Yemeni students do not want to be singled out in public, and they do not want others to laugh at them or at their mistakes, because of fear of being degraded in the classroom. Most probably, female students asked question not in class but, after the class, when there is less risk of loss of faces. This tendency to postpone questions is reinforced by Yemeni students’ sensitivity to unnecessary questions - they do not want to waste other students’ time or sidetrack the teacher’s talk through their own questions (Riddle, 1990).

Students in Yemen are not as extroverted as those in the west. They often preferred to be asked to answer a question rather than to initiate one. It is a kind of cultural difference and can be seen as manifesting introvert attributes. It is linked to the collective nature of Yemeni society in which students are expected to avoid standing out or risk shame in front of others, whereas many more individually oriented western learners feel much more at ease about asking questions in a more individualistic culture (Parnell & Hatem, 1999).

The findings reveal that Lack of questioning can influence the students learning processes and outcome of science learning; as ‘Questioning’ is acknowledged to be the heart of good interactive teaching. In scientific inquiry learning, students would have to have the ability to ask questions, make observations and utilize critical thinking skills and conduct experiments. Questions must be appropriate, and if possible fill or serve a variety of functions including the objectives of the lesson, activation of prior knowledge as a set induction, evaluation of learning outcomes and as the conclusion of the lesson (Riddle 1990). This can be seen in the excerpt below:

Extract 6

“I disagree....because some of teachers asked us if we have questions...but I feel shy asking questions...I am afraid to ask a silly question. I feel embarrassed if students laugh”- student (1)

“Frankly, I am a shy girl, which I know that it is difficult to ask questions in front of the boys, therefore, if I have a question I just go to the teachers' office”- student (14).

“They never do that... we are shy to ask questions because it is the first time we study with girls but when it come to boys it is no problem...when we study with girls we could not speak”- student (19).

In the Yemeni collective context, the loss of face of the individual can often cause others to lose face or even the whole group to do so. Losing face has a wide social, religion, intellectual and even a moral dimension.

According to Corrtazzi and Jin (1996:196) for many Western students questions have a clear heuristic function (‘if you don’t ask you won’t know’) and are often welcomed by teacher as discussion-promoting devices. In Yemeni society questioning those in authority is likely to be interpreted as challenging, or as showing disrespect to their authority. This phenomenon could be explained and linked to the earlier formative years in the Yemeni educational system and learning culture.

In Yemen schooling system, at kindergarten and primary levels, children are strictly taught to be obedient to orders and rules as exposed to them. They are not taught to develop their own unique personalities and bring out strange questions because of the characteristic long-inherited in the Yemeni culture. The basics of learning are obedience, harmony, congruence with good etiquettes. Teachers consider students as one-sided receptacles as they do not see any good in the students asking questions in the class (Angela Abu-Asba, 2011).The researcher proposed that teachers should encourage students to participate more actively in the classroom. Vygotsky (1978) stated that science teachers would need to adopt student-centred strategies and create opportunities for students to interact and collaborate with both their teachers and peers on their academic.

CONCLUSION

This study aimed to investigate the students’ academic literacy practices in science at the tertiary level and to investigate how science is perceived at the Faculty of Science, Sana’a University, Yemen.

The discussion presented in this paper highlights the nature of learning science in

English/Arabic Language among non- native science learners. The findings discussed in this paper put forward important pedagogical implications in teaching science and teaching content text in English.

1. Science learning for the students' future carriers: The findings indicate that students believe that studying science is important for their future carrier. This believes comes from the idea that science is the foundation of an innovative culture and the core of political decisions. Understanding science is vital for Yemeni science students so they can be an active and informed in the country's future.
2. Sana'a University support for science learning: The support of Sana'a University for learning science is discussed in this paper which shows that there were lack and shortage from Sana'a University side. Therefore, the Ministry of a Higher Education might need to reconsider the learning environment at the Faculty of Science in terms of infrastructure (labs, equipment, classroom halls, and science library). They also need to grant financial and administrative independence to the Faculty of Science.
3. The use of bilingual practices as learning resources: The findings indicate that students tend to rely on the translated Arabic Language to help them comprehend their science learning. This could be due to the low level of English Language proficiency and competency amongst the Yemeni science students. Another factor that leads to this phenomenon could be due to the late start of learning science in English.
4. Science curriculum: The findings reveal that the content of the science textbooks are shallow, out-fashioned, poor and non-schematic drawings, and lack of references. Hence, the science curriculum should be introduced to students as building blocks in which concepts are defined and organized in meaningful ways. The science curriculum implemented at the Faculty of Science needs development, reconsideration and improvement to be matched with Faculty potentialities and needs. They should implement integrated curricula that are up-to-date, flexible and intellectually rigorous, to emphasize thinking skills and problem solving.
5. Lectures roles in learning: From the findings it shows that the teachers' teaching style is still the traditional method mostly in the form of the visual and auditory learning styles and this is also mired in the classroom observation and video recorded. Teachers of the Faculty of Science should use of reciprocal teaching where teachers must ensure that there is a two-way communication between teachers and students. The teachers must encourage students to go beyond answering questions, and engage them in discourse (Riddle 1990). This will motivate almost all, if not all, students to participate in class and become engaged with real learning. This is hoped to lead to improvement in the standard of the teaching and learning of science, resulting in well- educated science graduates who will be able to make significant contributions to the development of Yemen. The empowerment of teachers by means of improving their science teaching skills is another goal of the Yemeni educational reform. Policy initiatives to address the quality of the teaching force include the establishment of

teacher training programmes, providing both pre-service and in-service training opportunities (Al-Abidi, 2006).

6. **Role of questioning in the learning of science:** Lack of questioning can influence students learning processes and outcome of science learning. The findings of the study indicate that science students shy away from being questioned or being embarrassed, or putting any contributions. Therefore, it is suggested that the use of reciprocal teaching where teachers must ensure that there is a two-way communication between teachers and students. The teachers must encourage students to go beyond answering questions, and engage them in discourse (Riddle 1990).

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