

RETHINKING BIOLOGY TEACHING AT THE UNIVERSITY OF NAMIBIA: INSIGHTS FROM STUDENT PROFILING

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ABSTRACT

The University of Namibia students today are very diverse. This is largely due to differing cultures, learning styles and levels of emotional and social maturity. Acknowledging this diversity will help avoid the “common sense” based predisposition of higher education teachers to treat every student the same. Diagnosing student needs and crafting learning experiences in response to revealed diagnoses is therefore imperative. In this study, second year Biometrics students were profiled with a focus on the social, economic, political and psychological aspects of their lives. Data from Sixty five (65) Biometrics students from the Department of Biological Sciences at the University of Namibia were recorded using a two-part questionnaire. The first part of the questionnaire comprised personal and socio-economic questions and the second part was a VARK questionnaire. The VARK questionnaire was used to determine a person’s sensory modality preferences. The percentage of the students who fell into the four modalities, that is, visual, aural, read/write, kinaesthetic or multimodal was determined. The most popular learning style was multimodal (61.3%). In addition, there was a significant relationship between the race of the student and their mode of transport to the University campus (Chi-square, $p < 0.001$) with most of those who walk to campus and those using buses or taxi being black. A highly significant association existed between race and student funding (Chi-square, $p < 0.001$), with the majority of black students on NSFAF funding (40). This study reveals the

government's commitment to the funding of higher education since the majority of the previously disadvantaged black students are funded by NSFAF. The internationalisation of Namibian higher education and cross-border provision of higher education have increased student diversity, hence the need to respond to such diversity in our academic practice. We therefore recommend the tracking of these students until they finish their degree program to see if application of the knowledge acquired through this study will improve student learning and performance.

KEYWORDS: Biology, Learning styles, Student profiling, University of Namibia, VARK.

INTRODUCTION:

Students at the University of Namibia are diverse. They arrive at the University with differing levels of emotional and social maturity. They come from differing cultures and have different learning styles and profiles, and education backgrounds. Marton and Säljö (1976) identified two different levels of processing information, namely deep-level and surface-level processing, corresponding to the different aspects of the learning material on which the learner focuses. Biggs (2012) identified the teaching challenge as being able to shift students from surface to deep approaches to learning. In the case of surface-level processing students direct their attention towards learning the text and have a 'reproductive' conception of learning forcing them to keep to a rote-learning strategy. "In the case of deep-level processing, on the other hand, the student is directed towards the intentional content of the learning material (what is signified), i.e., he or she is directed towards comprehending what the author wants to say about, for instance, a certain scientific problem or principle" Marson and Saljo (1976, p. 7).

Biggs (2012) argues for teaching methods that shift the academic orientation of the students as well as their levels of engagement in their learning tasks from surface level learning to deep-learning.

Students have different learning preferences that could affect how they learn. That should inform the teaching practitioners to avoid the “common sense” based predisposition of teaching so that students are treated as per their learning inclinations. This means that students do not all respond equally well to the same instructional methods. There is a demand for teachers to provide instruction matched to the learner differences (Leite, Svinicki, and Shi, 2010). Knowing the students’ learning styles can maximize teaching and learning milieus (Marcy, 1997). Keefe (1987) views learning styles as incorporating cognitive, affective, and physiological style elements of the student. “The goal of the teacher is, therefore, not to suggest that individuals from a particular culture ought to learn in a particular way, but rather to come to understand the great range of learning preferences that will exist in any group of people and to create a classroom flexible enough to invite individuals to work in ways they find most productive” (Tomlinson, 2001).

Learning styles is a term used to refer to the methods of gathering, processing, interpreting, organizing and thinking about information (Marcy, 2001). It is essential for the teacher and the learner to become aware of learning preferences so that the instructional environment can be tailored to learner needs. Fleming (2001) designed the VARK profile to measure four different perceptual preferences for the input of information, which are visual (V), aural (A), read/write (R), and kinaesthetic (K). In addition, to the four, there is also a multimodal preference that is a mixture of those four modes.

As teachers, it is necessary to understand our students’ learning styles and profiles before we can get ideas across and engage them. In order to facilitate learning effectively, a good grasp of the major theories of adult learning that include self-directed learning and transformational

learning is imperative (TEAL Center staff, 2011, p. 1). Freire (1984, 2000) connects transformative learning to the development of awareness or critical consciousness that precipitates liberation at individual (inward liberty) and social levels (outward independence). In supporting transformative learning, Mezirow (1995) argues that the purpose of adult learning is to develop the realization of personal experience and critically interpret it accordingly instead of just acting according to the purposes, convictions, assessments and feelings of other people. Thus, transformative learning is geared towards the development of independent and responsible thinking (Mezirow, 1997). According to Taylor (2008), critical reflection is inseparable from the process of development through individual experience. Taylor (2008) therefore argues for the holistic approach to transformative learning whereby the rational, emotional and spiritual dimensions of the individual are considered in fostering both individual and social change. The failure to recognize the learning styles and profiles of students could lead to higher dropout rates of young adults in higher education. In writing this paper, we are aware of the negative connotations that the word “profiling” carry in certain contexts where it is used to advantage and disadvantage other groups of people. In the present context, the concept is used mainly to understand the learning context, and learning preferences of the student in order to tailor teaching accordingly with the intent to help the student learn.

Quigley (1997) identified three major constellations of factors that contribute to student drop out, which he referred to as situational (influences of the adult’s life circumstances), institutional (influences of systems), and dispositional factors (influences of experience). He suggested that situational influences are largely beyond the control of adult education programs, although they receive most of the attention in the literature on dropouts (Quigley, 1997). Institutional factors are areas that practitioners could affect and should work on continuously. Quigley (1997) also suggested that dispositional factors, such as negative attitudes toward education as a result of previous failures in

school, provide a focus for program reform that might affect persistence. Diagnosing student needs and crafting learning experiences in response to diagnoses is therefore imperative for teaching practitioners.

METHODOLOGY

The students attending second year Biometrics II classes are mostly young adults. As such, the aim of this study was to profile these students focusing on the social, economic, political and psychological aspects of their lives so as to remove barriers to learning by establishing a positive and cooperative learning environment.

Data from Sixty five (65) Biometrics II students from the Department of Biological Sciences at the University of Namibia were recorded using the questionnaire method. A two-part questionnaire was used to collect student information. The first part of the questionnaire comprised personal and socio-economic questions and the second part was a VARK Questionnaire (Version 7.1, 2018) (See Appendix). The VARK questionnaire is a tool used to determine a person's sensory modality preferences. Sensory modalities or modal preferences are learning styles or methods used to process information. It is important to note that this questionnaire was not designed to be diagnostic or predictive of ones abilities. A copy of the questionnaire was printed and presented to every student to complete during class time. Participation in this study was not mandatory, and respondents were duly informed of what the study was all about.

Data were transcribed from the questionnaires and recorded in an excel spreadsheet for data presentation. Data Analysis was performed using the IBM (Statistical Package for the Social Sciences) SPSS software VERSION 24. The data on learning style preferences were analyzed by the VARK Questionnaire (Version 7.1) software on the computer at the following site <http://vark-learn.com/the-vark-questionnaire/>. The

percentage of the students who fell into the four modalities (i.e. categories, visual, aural, read/write, kinesthetic or multimodal) was determined.

RESULTS

The VARK Profile

Of these 65 students, forty one of the students fell into the multimodal category, eight fell into the read/write category and eight students fell into the kinesthetic category, two fell into the visual category and five into the auditory category (Figure 1). One student's data were insufficient for the program to assign him a category. All of the categories were represented in various combinations in the multimodal category. The most popular learning style was multimodal (61.3%) (Figure 1).

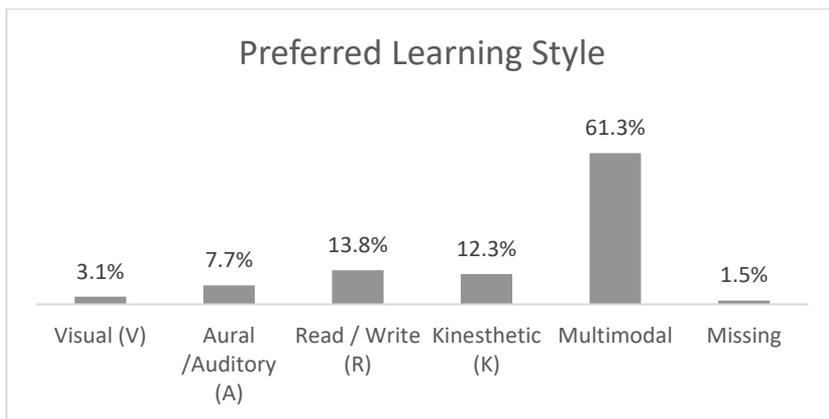


Figure 1. Preferred Learning Styles of the students. The most popular learning style was multimodal (61.3%)

Demographic profile

The students' ages ranged from 18 to 25 years with a mean of 20.62 and a standard deviation of 1.51 years (95% confidence interval: 20.24 - 21.01). The modal age was 20 years. The majority of the students in the Biometrics II class are females (69%) and single (98%). Only one was married. The majority of students were Namibians (97%) with only one Zambian and one Zimbabwean. The composition of the students with regard to ethnicity was mainly Oshiwambo (55.4%) followed by students from the Zambezi region (12.3%), the Kavango region (9.2%) and to a lesser extend the Afrikaaners (4.6%). With regard to race, the distribution of the students was: Black (85%); Mixed /Coloured (9%) and White (6%). The mother tongues of the students were various with the Oshiwambo speaking being the dominant group (53.8%) followed by the Afrikaans (10.8%), Rukwangali (6.2%) and the Subia (7.7%). The family sizes of the students (parents and siblings) ranged from 1 to 17 with a mean of 6 and a standard deviation of 3 (95% confidence interval 5–7). The distribution of the parents' occupations were as follows: undisclosed (12.3%); employed in administrative fuctions (4.6%); employed in general functions (7.7%); employed in professional functions (38.5%); retired (4.6%); unemployed (13.8%); and non-response (18.5%).

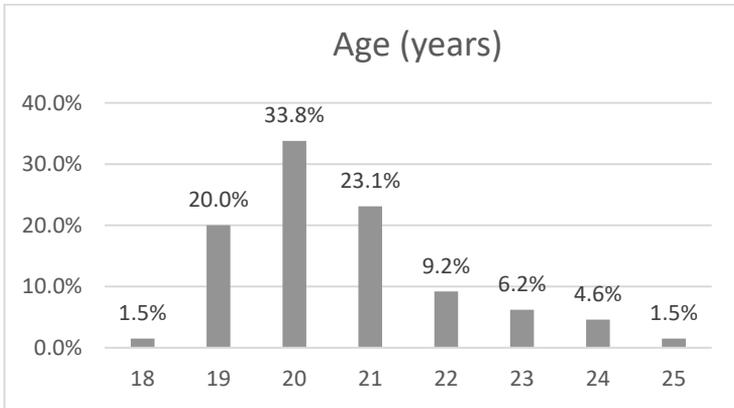


Figure 2. Age distribution of the students. The students' ages ranged from 18 to 25 years with a mean of 20.62 and a standard deviation of 1.51 years (95% confidence interval: 20.24 - 21.01). The modal age was 20 years.

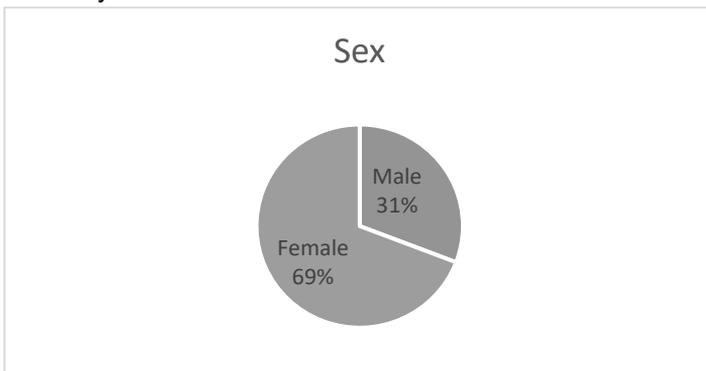


Figure 4. Sex of the students. The majority of the students are females (69%)

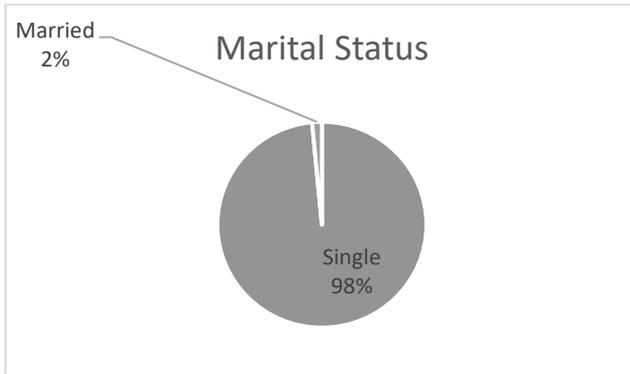


Figure 3. Marital status of the students. The majority of students were single (98%). Only one was married.

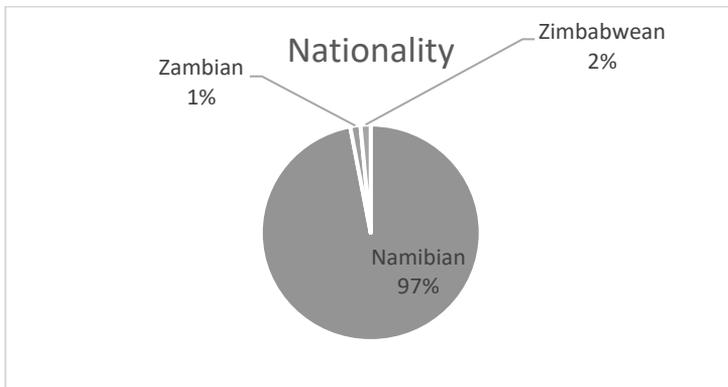


Figure 5. Nationality of the Biometrics II students. The majority of students were Namibians (97%) with only one Zambian and one Zimbabwean.

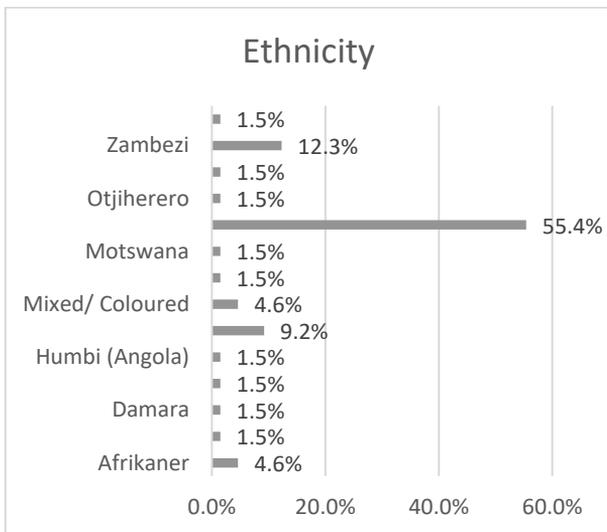


Figure 6. The ethnic grouping of the students. The composition of the students with regard to ethnicity was mainly Oshiwambo (55.4%) followed by students from the Zambezi region (12.3%), the Kavango region (9.2%) and to a lesser extend the Afrikaners (4.6%).

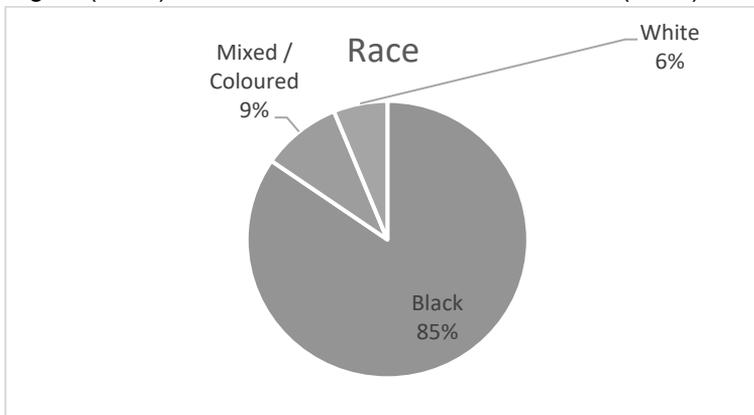


Figure 7. Race of the students. With regard to race, the distribution of the students was: Black (85%); Mixed /Coloured (9%) and White (6%).

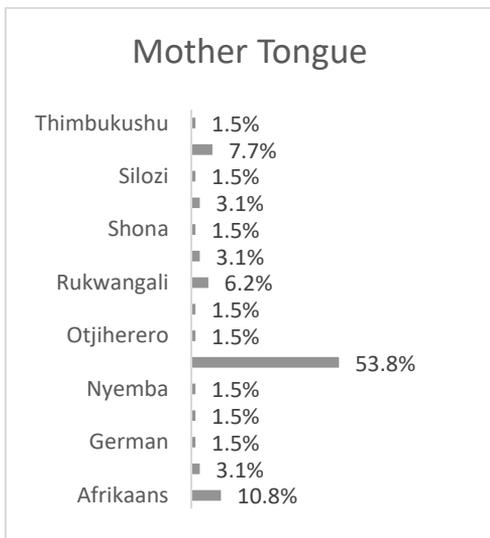


Figure 8. Mother tongue of the students. The mother tongues of the students were various with the Oshiwambo speaking being the dominant group (53.8%) followed by the Afrikaans (10.8%), Rukwangali (6.2%) and the Subia (7.7%).

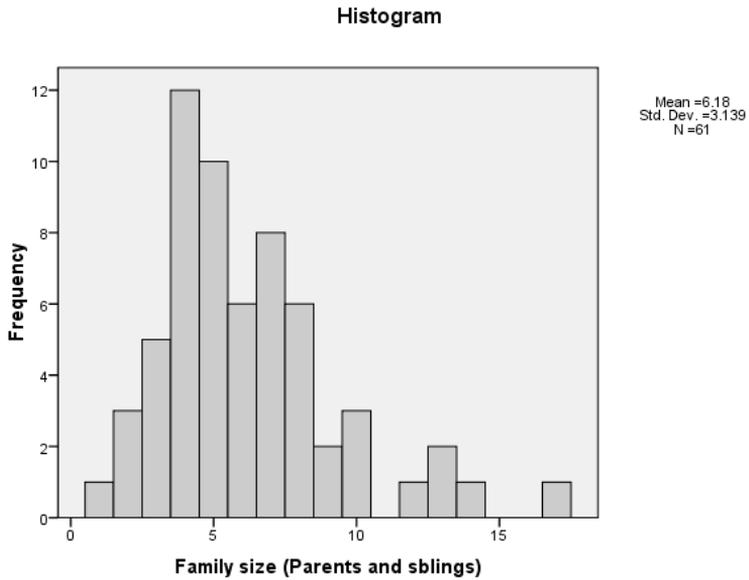


Figure 9. Family sizes of the students. The family sizes of the students (parents and siblings) ranged from 1 to 17 with a mean of 6 and a standard deviation of 3 (95% confidence interval 5 – 7).

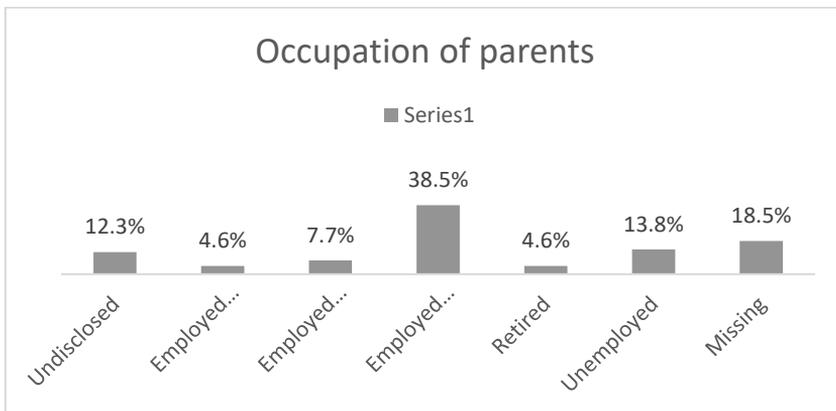


Figure 10. Occupation of parents. The distribution of the parents' occupations were as follows: undisclosed (12.3%); employed in administrative functions (4.6%); employed in general functions (7.7%); employed in professional functions (38.5%); retired (4.6%); unemployed (13.8%); and non-response (18.5%).

Academic profile

The majority of the students had entered UNAM in 2017 (56.9%). Most of the students attended their high school in urban areas (66.2%). The majority of students attend public high schools (78.5%). The students' years of exit from high school ranged from 2012 (4.6%); 2013 (3.1%); 2014 (13.8%); 2015 (27.7%); and 2016 (41.5%). Most of the students had left high school in 2016.

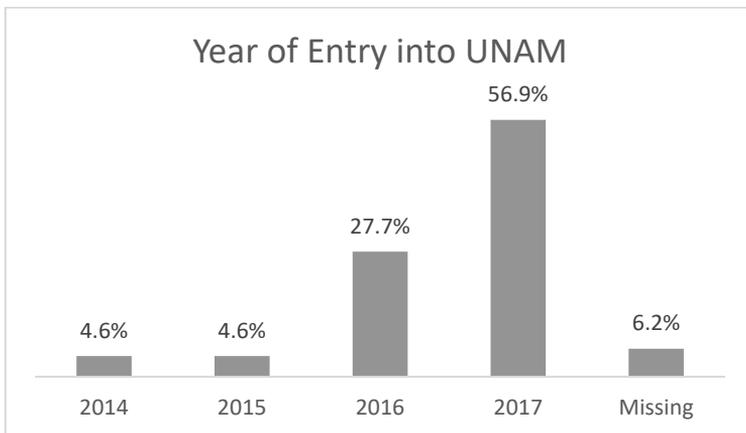


Figure 11. Students' year of registration at UNAM. The majority of the students had entered UNAM in 2017 (56.9%).

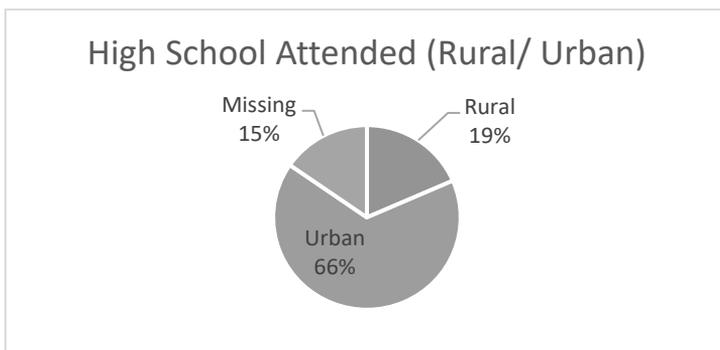


Figure 12. Percentage of students who attended high school in urban or rural areas. Most of the students attended their high school in urban areas (66.2%).

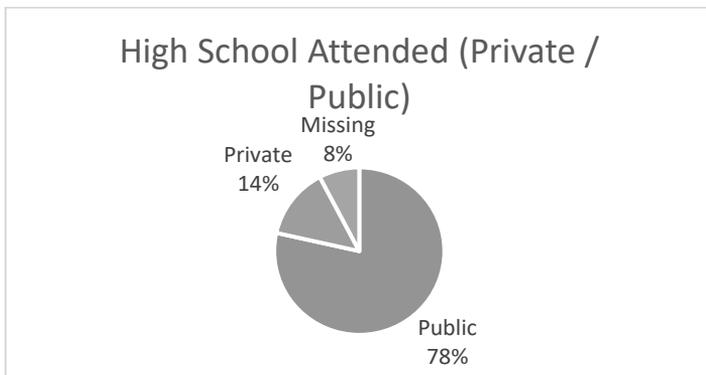


Figure 13. Percentage of students who attended private or public high schools. The majority of students attend public high schools (78.5%)

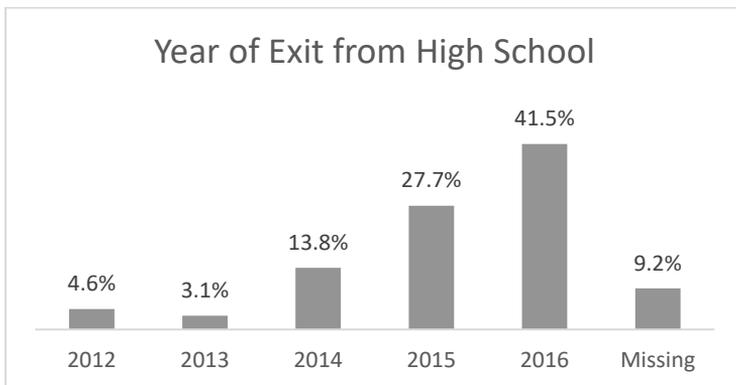


Figure 14. Year of exit from High School. The students' years of exit from high school ranged from 2012 (4.6%); 2013 (3.1%); 2014 (13.8%); 2015 (27.7%); and 2016 (41.5%). Most of the students had left high school in 2016.

Living arrangements

The distribution of students according to area of residence was almost even with the highest percentage residing in medium density suburbs (26.2%). Only 29% of the students lived with their parents with the rest either living with relatives (31%) or other living arrangements. Only 17% of the students owned the houses where they resided while the rest were either renting (31%) or other housing arrangements (48%). The majority of the students generally felt that their study environment were conducive (85%).

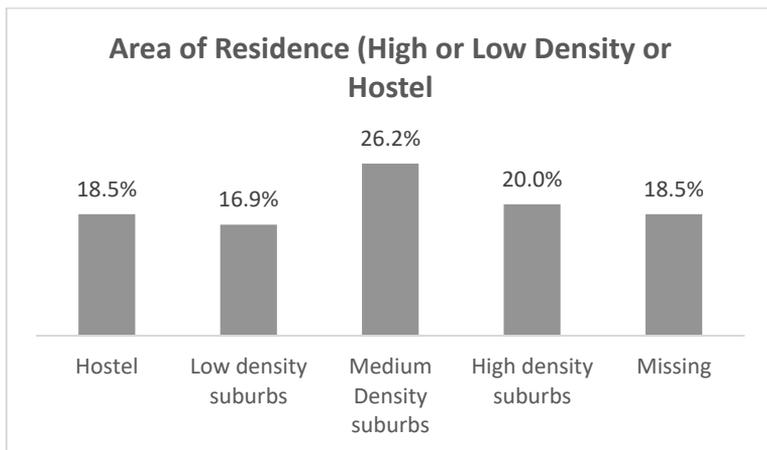


Figure 15. Area of residence of the students. The distribution of students according to area of residence was almost even with the highest percentage residing in medium density suburbs (26.2%).

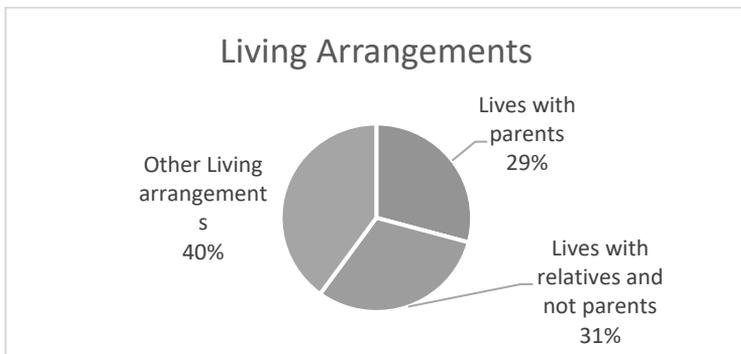


Figure 16. Living arrangements of the students. Only 29% of the students lived with their parents with the rest either living with relatives (31%) or other living arrangements

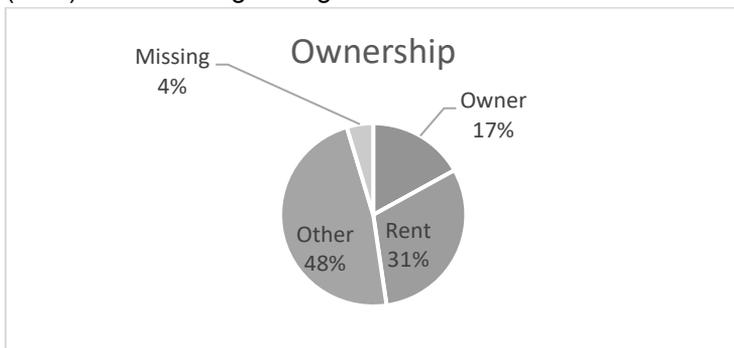


Figure 17. House ownership. Only 17% of the students owned the houses where they resided while the rest were either renting (31%) or other housing arrangements (48%).

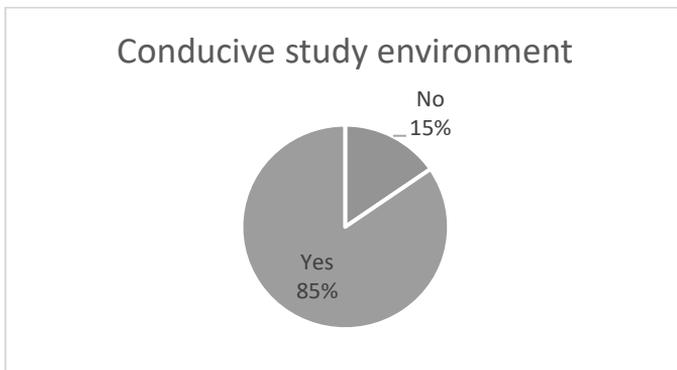


Figure 18. Percentages of students who live in conditions conducive for study. The majority of the students generally felt that their study environment were conducive (85%).

Transport to campus

Twenty six percent of the students were resident on campus. For the non-resident students the most common mode of transport to campus was bus or taxi (46.2%).

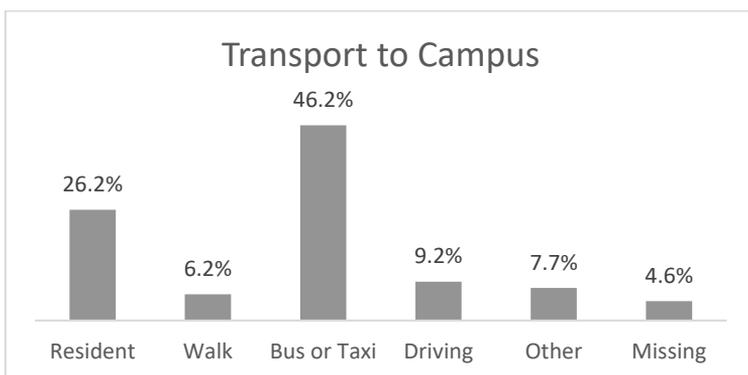


Figure 19. Mode of transport to Campus. Twenty six percent of the students were resident on campus. For the non- resident students the most common mode of transport to campus was bus or taxi (46.2%).

Funding

The majority of the students were funded by NASFAF (63%) while 28% were self-funded. A few students had bursaries (3%) or some other form of funding (1%).

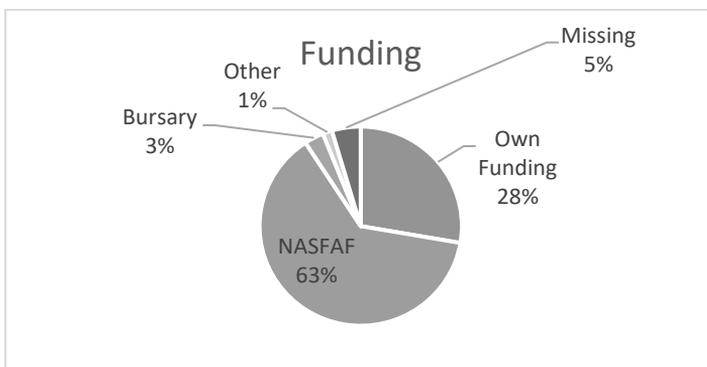


Figure 20. Student Funding. The majority of the students were funded by NASFAF (63%) while 28% were self-funded. A few students had bursaries (3%) or some other form of funding (1%).

Disability

Most of the students did not have any form of disability. The distribution of disabilities was vision (18.5%), Hearing (1.5%); Chronic conditions (1.5%); multiple conditions (6.2%) and other forms of disabilities (3.1%).

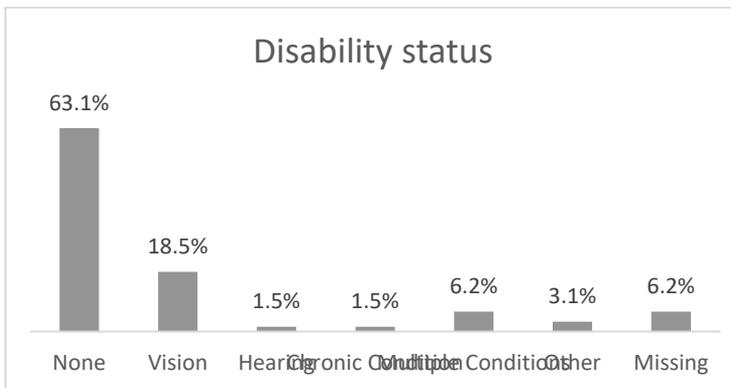


Figure 21. Disability status of the students. Most of the students did not have any form of disability. The distribution of disabilities was vision (18.5%), Hearing (1.5%); Chronic conditions (1.5%); multiple conditions (6.2%) and other forms of disabilities (3.1%).

Results of Chi-square Tests of associations between pairs of social, economic, political, and psychological aspects of student lives.

Chi-square tests of association were conducted at 5% level to establish whether significant relationships existed between pairs of social, economic, political, and psychological aspects of student lives. The cross tabulations of variables exhibiting significant relationships are presented in Table 1–4. There was a significant relationship between the race of the student and their mode of transport to college (Chi-square =37.984, $p < 0.001$) with the most of resident, those who walk to campus and those using buses or taxi being black. A highly significant association exists between race and student funding (Chi-square=23.84, $p < 0.001$), with the majority of black students on NSFAP funding (40).

A significant association was also established between the Gap years (i.e. Gap in years between exiting High School and commencing studies at UNAM (Chi-square = 37.001, p = 0.001). Among the students taking gap years, most of them had parents either in professional or undisclosed professions. There as a significant association between disability status and whether the study environment was conducive (Chi-square=16.888, p=0.005). Even though most students in general felt that the study environment was conducive, the study environment was not conducive for the two students with hearing challenges and chronic condition respectively.

Table 1. Association between mode of transport to campus and race

Transport	Race			
	Black	Mixed/ Coloured	White	Total
Resident	16	1	0	17
Walk	4	0	0	4
Bus/ Taxi	28	1	1	30
Driving	0	3	3	6
Other	4	1	0	5
Total	52	6	4	60

Table 2. Association between Funding and race

Funding	Race			
	Black	Mixed/ Coloured	White	Total
Own private Funding	11	4	3	18
NSFAF	40	1	0	41
Bursary	0	1	1	2
Other	1	0	0	1
Total	52	6	4	62

Table 3. Association between mode of transport to campus and race

Occupation of parents	Gap years (Gap between exiting High School and Entering UNAM)			
	<u>0</u>	<u>1</u>	<u>2</u>	Total
Undisclosed	3	1	3	7
Employed (Admin)	0	1	0	1
Employed (General)	5	0	0	5
Employed (Professional)	15	4	2	21
Retired	2	0	0	2
Unemployed	6	3	0	9
Total	31	9	5	45

Table 4. Association between disability and conducive study environment

Disability Status	Conducive Study Environment?		
	<u>No</u>	<u>Yes</u>	Total
No Disability	4	37	41
Vision	1	11	12
Hearing	1	0	1
Chronic Condition	1	0	1
Multiple Conditions	0	4	4
Other	1	1	2
Total	8	53	61

DISCUSSION:

The results of this study call for a rethinking of Biology teaching so that it responds to the different variables that define student diversity and learning preferences. This study has revealed that gender, nationality/ethnicity/race, family size, parents' occupation, age, marital status, mother tongue, academic background, living arrangements, year of exiting high school, transport to campus, funding and disability are important variables that can affect student learning and learning styles. These findings are consistent with Namibia's Vision 2030 with respect to improving the quality of higher education.

Namibian Vision 2030 emphasizes attained level of development, and quality of life for all citizens, comparable to that of the developed world. It is driven by a high premium on knowledge, and its application, as some of the key drivers of economic growth and social development. The provision of a well thought higher education will enable the country to participate fully in the global arena in this era of globalisation. Understanding the various variables raised in this study in relation to effective and meaningful teaching and learning will enable Namibia to transform into a knowledge economy as envisaged in Vision 2030. This means that among other things there is need for an educated population capable of applying knowledge to promote development. It is therefore imperative that the government provides access to higher education. Effective and meaningful teaching and learning in higher education is therefore positively correlated to the economic development of the nation. The Namibian government should set up the Namibia Students Financial Assistance Fund (NSFAF) for funding Namibian students, especially those from poverty-stricken communities or those previously disadvantaged by the former apartheid regime.

The historical context of the students, especially of being previously disadvantaged by apartheid, has exerted pressure on the attainment of emancipating form of education in Namibia. The majority of learners at the University of Namibia come from a background where they were

previously disadvantaged by the discourses of apartheid and colonialism (Figures 6 and 8). Consequently, a concern for inclusivity in learning styles and profiles of students in Higher Education dominates the cultural conditions from which current teaching and learning practices emerge in the country.

The post independent education system is based on four main pillars namely; access, equity, democracy and quality, and are viewed corporately as the cornerstone of socio-economic development in the new dispensation (Amadhila, Dengeinge, Miranda and Shikongo, 2011). It is this access, equity, democracy and quality that are being addressed by the practices of teaching and learning at the University of Namibia. This study reveals the government's commitment to the funding of higher education since the majority of the previously disadvantaged students are funded NSFAP. A highly significant association exists between race and student, with the majority of black students on NSFAP funding.

The internationalisation of Namibian higher education and cross-border provision of higher education have increased student diversity (Figure 5), hence the need to respond to such diversity in academic practices. This poses tremendous teaching and learning challenges as teachers endeavour to deliver subject content to students from different domestic and occupational situations (see Figures 9 and 10) with different backgrounds and levels of preparedness. Under such circumstances it has been shown that traditional "knowledge delivery" models are inadequate to address the challenges of student diversity (Northedge, 2003, p. 17).

Tomlinson (2001) argues that gender influences student learning. She further argues that "some of the same elements that are influenced by culture can also be influenced by gender" and gave examples like expressiveness versus reserve, group versus individual orientation and analytic versus creative or practical thinking (Tomlinson, 2001). An awareness of gender-based learning preferences (Figure 4) and

culture-influenced learning preferences is essential (Figure 6). Culture can influence student learning in multiple ways. The cultural disposition of the students such as whether they are reserved in expressing emotions or not, whether they prefer instructional material that is discrete or impersonal, can affect learning (Tomlinson, 2001). Some learning patterns are culture-specific, thus the teacher should be aware of these variances (Tomlinson, 2001).

VARC helps student learning by suggesting the most appropriate learning strategies for each learning preference. It is intended to be an early intervention in the students' learning in order to maximize their learning and success. According to Fleming (2001), Visual individuals prefer to learn information presented in charts, graphs, and other symbolic devices instead of words; those with an auditory or Aural preference learn from spoken lessons and talking (information that is "heard or spoken"), such as lectures, group discussion, radio, email, using mobile phones, speaking, web-chat and talking things through; those with a read and write preference need the teacher to emphasize text-based (the printed text) input and output – reading and writing in all its forms but especially manuals, reports, essays and assignments; and kinaesthetic perceptual preference is related to the use of experience and practice and individuals with this dominant mode prefer to learn through direct practice, for example, demonstrations, simulations, videos and movies of "real" things, as well as case studies, practice and applications. The critical question to be asked is whether the teaching practitioners in Department of Biology are varying their teaching approaches to respond to these learning preferences as outlined by Fleming (2001).

The majority of the students studied have a multimodal learning preference which is a mixture of the four perceptual modes (Figure 1).

There are two types of learning styles under the multimodal learning preference namely those who are flexible in their preferences and can switch from mode to mode depending on what they are working with

and those who need input (or output) in all of their preferred modes to enhance deep learning. Consistent with Fleming (2001), there is a need to be very flexible and accommodating in our teaching practice. Those with a multimodal learning preference do not have a standout mode with one preference score well above other scores.

There is a call for us to critically reflect on our practice so as to transform Biology teaching to make it fit for purpose. Some of the students take gap years after High School before entry into University (Figures 11 and 14). Teaching practitioners should critically reflect on their practice so as to transform Biology teaching to make it fit for purpose. Tracking of the students studied here until they finish their degree program will be immensely useful so as to fully link their profiles with the way they learn and ultimately, their academic performance. As such, we further recommend that a study be carried out on to establish whether our teaching styles address our students' learning styles at the University of Namibia. There is need that the teaching practitioners in the Department of Biological Sciences vary their teaching approaches to respond to these learning preferences as outlined.

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