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Learning approach and teaching style preferred by pharmacy students: Implications for educational strategies in Zambia

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Abstract

Introduction: Identifying how students' approach their learning and ways they prefer to learn can enable educators enhance teaching and learning experiences for quality educational outcomes.

Aim: This study explored the learning approaches and teaching style preferences of pharmacy students in Zambia.

Methods: The research instrument was the 'Approaches and Study Skills Inventory for Students' (ASSIST) questionnaire. Data were collected from 147 undergraduate pharmacy students at University of Zambia and statistically analysed using Stata 13.

Results: Strategic learning approach was predominant among a majority (67%) of pharmacy students. Only 25% adopted a deep learning approach and 7% were surface learners. Learning approach was statistically significantly associated with course load (p=0.028) and programme stage (p=0.010). The majority (67%) preferred teaching that transmitted information while only 23% preferred teaching styles that encouraged and supported understanding of taught material. There was no statistical association between students' learning approach and their teaching style preference (p=0.085).

Conclusion: The predominance of strategic learning approach and preference for teaching that transmitted information raises concerns on current educational strategies employed by both the curriculum and educators.

Keywords: *Approach to Learning, Teaching Style Preference, Pharmacy, Students, Zambia*

Introduction

A growing body of evidence suggests students' approaches to learning can influence educational outcomes (Brown *et al.*, 2015). 'Approaches to Learning' (ATL), as described by Marton and Saljo, refer to qualitatively distinct ways and methods that students go about their learning, adopt motivational strategies for engaging with a learning task and take to studying, depending upon the perceived objectives of the course or study programme (Marton & Saljo, 1997). The three learning approaches promulgated are as follows: 'Deep' learning approach characterised by intention to understand, apply, engage with and operate in, valuing and relating ideas in the subject; 'Surface' learning approach that is characterised by student's intention to accomplish the minimum tasks of the discipline, routine memorisation and fear of failure; 'Strategic' learning approach refers to organised studying where the student's intention is to maximise efficiency and efficacy when studying, paying special attention mainly to assessment demands so as to achieve high grades (Marton & Saljo, 1997; Entwistle, McCune & Walker, 2001; Lublin, 2003). Entwistle and colleagues established that the student's motive characterises each approach (Entwistle, McCune & Walker, 2001).

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Globally, training of health professionals has undergone a paradigm shift from a focus on educational processes to learning outcomes (Norcini, Lipner & Grosso, 2013). Similarly, in response to the changes in new scientific discoveries, technology trends and growing disease burden, as well as the advanced competencies required of pharmacists for contemporary and future practice as health professionals, pharmacy education around the world is transitioning from a primary focus on drugs and medicinal products to a focus on patient care (International Pharmaceutical Federation [FIP], 2014). This is because pharmacists today are expected to deliver a range of patient-centred pharmaceutical care services designed to meet the complex needs of their patients and the communities they serve (Smith *et al*., 2010). Consequently, contemporary pharmacy training curricula should be tailored towards ensuring students attain not only requisite scientific and clinical knowledge, but also the skills and attitudes required to practice as healthcare professionals. This requires, in addition to quality teaching, pharmacy students adopting learning approaches that enable them to acquire, express and apply knowledge, professionalism, critical-thinking, problem-solving and life-long learning skills (Ofstad & Brunner, 2013; Gilliam *et al*., 2018).

The University of Zambia (UNZA), the oldest public university in Zambia, has been training pharmacists since 2001. Currently, it is the only public university training pharmacists in Zambia. The University offers a four-year full-time undergraduate Bachelor of Pharmacy (B.Pharm.) degree programme. The programme has an enrolment capacity up to 350 students across the years of study. This is broken down as follows: 50 students intake enrolled at Year 1 through quota (points-based) selection from pre-pharmacy (A-level) foundation year; 100 students intake at Year 2, *i.e*., 50 students proceeding from Year 1 (assuming no attrition) and additional 50 enrolled *via* direct-entry admission route (called parallel programme admission for applicants with Diploma in Pharmacy Technology exempted from Year 1); 100 students intake at Year 3, *i.e*., students proceeding from Year 2 (assuming no attrition) and 100 student intake at Year 4, *i.e*., students proceeding from Year 3 (assuming no attrition). The B.Pharm. curriculum structure consists of two principle stages: pre-clinical and clinical stages, respectively. In the pre-clinical stage (Year 1 and 2), students undertake general pharmaceutical and health science disciplines which are pre-requisites to the clinical stage (Year 3 and 4) where they undertake mostly clinical disciplines and experiential learning in relevant pharmaceutical care settings (Kalungia *et al*., 2019). Arguably, the B.Pharm. curriculum in Zambia in all its iterations places much emphasis on content coverage whereas little attention has been paid to how, individually or collectively, pharmacy students learn and the influence current educational strategies of the curriculum and educators have on the quality of learning.

It is currently not known how pharmacy students at UNZA approach their learning and which teaching styles they prefer. The learning approaches and teaching preference may be a response to the learning environment, inadvertent educational demands placed on students or could be a pre-existing tendency (Beaten *et al*., 2016; Ezeala, 2016). Either way, knowing about these two characteristics can warrant educational interventions. In consonant with Elliot and Church, the ideal learning environment is not just about the quality of teaching alone but that which promotes students' motivation to master, acquire and apply a deep understanding of the learnt material, as well as develop self-directed and independent study skills (Elliot & Church, 1997). It is such an approach to learning that pharmacy education programmes must aspire to attain in their students so that competent pharmacists with critical thinking, problem-solving and life-long learning skills are produced for the health sector (Ofstad & Brunner, 2013).

In Zambia, definitive research that interrogates, from the perspective of pharmacy students, how they learn and prefer to be taught has been lacking. The aim of this study was to determine undergraduate pharmacy students' learning approaches and teaching style preference at UNZA. Specifically, the authors determined associations between learning approaches and students' socio-demographic characteristics, and compared learning approaches and teaching style preferences between students in preclinical and clinical stages of pharmacy education. This evidence is required to inform gaps in pharmacy educational strategies and teaching practice in Zambia.

Methods

Study design

This was a descriptive, cross-sectional study utilising quantitative methods.

Sampling

The study population was undergraduate pharmacy students at UNZA enrolled in the 2017 to 2018 academic year. A representative sample was determined using the formula: n=*z*2.P(1-P)/*e*2 and corrected for a finite population with Cochran's formula: new n=n/1+(n-1/ N), where *z*-value=1.96 (representing 95% confidence level), P=prevalence estimate at 25%, *e*=margin of error at 5%, N=population size (based on programme enrolment capacity of 350 pharmacy students across all four academic year levels when quota enrolment full). The computed sample size of 158 was adjusted by 5% to account for non-response rate. To attain a representative sample across the different years of study on the B.Pharm. programme, participant selection was stratified by year of study using 25% proportionality.

Inclusion and exclusion criteria

To maintain a homogenous sample, only undergraduate pharmacy students studying full-time across the years of study (Year 1 to 4) on the B.Pharm. programme were considered. Any students on part-time mode of study were excluded.

Data collection

The Approaches and Study Skills Inventory for Students (ASSIST) questionnaire was used to determine students' learning approaches and their teaching style preferences. The ASSIST – a validated self-administered questionnaire developed by Tait, Entwistle and McCune (http://www.etl.tla.ed.ac.uk/questionnaires/ASSIST.pdf) comprises three main sections evaluating: (i) Conceptions of Learning (6 items); (ii) Approaches to Learning and Studying (52 items); and (iii) Teaching Style Preferences (8 items) using self-reflection statements/items rated on a 5-point Likert scale. A plethora of studies (Reid *et al*., 2005; Walker et al., 2010; Wickramasinghe & Samarasekera, 2011; Samarakoon *et al*., 2013; Brown *et al*., 2015; Valadas, Almeida & Araujo, 2017; Chonkar *et al*., 2018; Curtis, Taylor & Harris, 2018) have utilised the ASSIST specifically to evaluate different aspects of students' learning in health sciences. The authors distributed the ASSIST to pharmacy students using a systematic random selection from each class during the first term of the academic year. The sampling interval was calculated by dividing the population size (N) by the desired sample size (n) as follows: k=N/n=(350/158)=2.2. Therefore, every 2nd student on the official class lists containing the registered pharmacy students in each cohort (Year 1 to 4 classes, respectively) enrolled in 2017 was selected to participate on the survey.

Statistical analysis

Descriptive and inferential statistics were employed to analyse the data. Participant responses to the ASSIST items were aggregated as follows: firstly, ratios of summed scores to items of each scale were calculated by addition of numerical values of Likert scores (where, 'Agree'=5; 'Agree somewhat'=4; 'Unsure'=3; 'Disagree somewhat'=2; 'Disagree'=1); secondly, Cronbach's *alpha* was used to determine internal consistency of the ASSIST scales and sub-scales to detect the intended measure. For ease of comparison, learning approach item scores in each main scale ('Deep', 'Strategic' and 'Surface') were grouped and aggregated to reach an overall total score divided by the number of contributing sub-scale items. The scale with the highest total score was considered indicative of the predominant learning approach. Similarly, this method was applied to analyse teaching style preference scales on the ASSIST. Data for participants with incomplete questionnaires, including those with multiple or non-discriminating scores for learning approach categories (n=3) were recorded but excluded from the analysis.

The Shapiro-Wilk test confirmed continuous data were not normally distributed hence non-parametric statistical tests were employed. Sub-scale scores were presented as median (M) and interquartile ranges (IQR). Fisher's exact test was used to determine associations between learning approach, teaching style preference and demographic variables. Kruskal-Wallis equality of populations rank test followed by Dunn's post-test was used to compare ranked sums of learning approach categories among demographic variables while Wilcoxon signed-rank test was used to determine whether there were significant differences in median scores within each learning approach scale. Correlation between students' learning approaches and teaching style preference scores was determined using Spearman's correlation. Stepwise backward multinomial logistic regression was used to ascertain the association between dominant learning approach, age, gender, year of study, previous study, mode of admission and course load. The model likelihood ratio *chi*-square was 27.98 (p=0.006), which was considered a significant model fit. For statistical inference, a two-tailed p-value <0.05 was accepted as significant. All statistical analyses were done using Stata 13 software (Stata Corp, College Station, TX, USA).

Ethics approval

Ethical approval for this study was granted by the University of Zambia Biomedical Research Ethics Committee (IRB00001131 of IORG0000774). The approval reference number is 008-06-17.

Results

Participants' demographics

A total of 160 survey questionnaires were distributed with 150 returned (90% response rate) of which 147 that were successfully completed in full were used in the analysis. Among the 147 pharmacy students with valid responses, there were an almost equal number of males and females (Table I). The median age was 23 years (IQR: 18 – 45 years). The majority (67%, n=99) were below 25 years of age. There was no statistically significant difference in age between males and females (p=0.279). For mode of admission to the B.Pharm. programme, over two-thirds of the students (76%, n=111) were admitted via the regular (pre-foundation) admission mode and about a third (24%, n=36) were *via* the parallel admission (direct-entry) mode. Regarding prior learning attained, the majority (70%, n=103) were high school-leavers who had completed foundational A-level natural sciences in first-year of study at the University whereas only 30% (n=44) of the participants were direct-entry students who possessed a diploma in pharmacy technology.

Reliability of ASSIST scales and sub-scales

Table II shows Cronbach *alpha* coefficients determined for all three approaches to learning scales of the ASSIST. Cronbach *alpha* coefficients for the scales and sub-scales were not less than 0.6 except for 'unrelated memorisation' (0.56) and 'fear of failure' (0.55) sub-scales, respectively. The authors therefore were confident that the ASSIST questionnaire items were internally consistent and reliably detected student's learning approaches and teaching style preferences.

Table I: Participants' demographic characteristics

Variable	Categories	Proportion (n, %)
Gender	Male	74 (50.3)
	Female	73 (49.7)
Age	≤25 years	93 (66.9)
	>25 years	46 (33.1)
Year of study	Year 1	32 (21.8)
	Year 2	43 (29.3)
	Year 3	40 (27.2)
	Year 4	32 (21.8)
Mode of admission	Regular intake	111 (75.5)
	Parallel intake	36 (24.5)
Previous study	A-level Natural Sciences	103 (70.1)
	Diploma in Pharmacy Technology	44 (29.9)

Table II: Cronbach *alpha* coefficients of ASSIST scales and sub-scales to detect learning approaches (n=147)

Approach to Learning and Studying	No. of Items	Median Score (IQR)	Cronbach *alpha* coefficient
- Seeking meaning	4	17 (8 – 20)	0.60
- Relating ideas	4	15 (4 – 20)	0.71
- Use of evidence	4	17 (7 – 20)	0.62
- Interest in ideas	4	17 (9 – 20)	0.65
- Monitoring effectiveness	4	18 (11 – 20)	0.71
Deep Approach	**20**	**16.25 (9.25 – 19.5)**	**0.71**
- Organised studying	4	16 (7 – 20)	0.64
- Time management	4	18 (7 – 20)	0.60
- Achieving	4	18 (8 – 20)	0.67
- Alertness to assessment demands	4	18 (9 – 20)	0.74
Strategic Approach	**16**	**17.25 (9.75 – 20)**	**0.73**
- Lack of purpose	4	7 (3 – 18)	0.69
- Unrelated memorising	4	12 (5 – 19)	0.56
- Fear of failure	4	16 (5 – 20)	0.55
- Syllabus-boundness	4	14 (7 – 20)	0.66
Surface Approach	**16**	**12.25 (6.5 – 16.75)**	**0.68**

IQR = interquartile range

Table III: Association between learning approaches, teaching style preferences and demographic variables

Dependent Variable	Independent Variables: **Gender** (n, %)		**Age** (n, %)		**Programme Stage** (n, %)		**Mode of Admission** (n, %)		**Prior Learning** (n, %)		**Course Load** (n, %)	
	Male	Female	<25 years	>25 years	Pre-clinical	Clinical	Regular	Parallel	A-levels	Diploma	≤5 courses	>5 courses
Approach to Learning												
1. Deep	24 (64.9)	13 (35.1)	23 (63.9)	13 (36.1)	13 (35.1)	24 (64.9)	27 (73.0)	10 (27.0)	26 (70.3)	11 (29.7)	11 (29.7)	26 (70.3)
2. Strategic	47 (47.5)	52 (52.5)	61 (65.6)	32 (34.4)	59 (59.6)	40 (40.4)	73 (73.7)	26 (26.3)	67 (67.7)	32 (32.3)	16 (16.2)	83 (83.8)
3. Surface	3 (27.3)	8 (72.7)	9 (90.0)	1 (10.0)	3 (27.3)	8 (72.7)	11 (100)	0 (0)	10 (90.9)	1 (9.1)	5 (45.5)	6 (54.6)
	p = 0.060		*p = 0.294*		*p = 0.010*		*p = 0.131*		*p = 0.323*		*p = 0.028**	
Teaching Style Preference												
1. Encourages understanding	22 (66.7)	11 (33.3)	20 (66.7)	10 (33.3)	17 (51.5)	16 (48.5)	22 (66.7)	11 (33.3)	22 (66.7)	11 (33.3)	7 (21.2)	26 (78.8)
2. Transmits information	43 (43.9)	55 (56.1)	64 (68.8)	29 (31.2)	50 (51.0)	48 (49.0)	76 (77.6)	22 (22.5)	71 (72.5)	27 (27.6)	24 (24.5)	74 (75.5)
3. Both 1 and 2	9 (60.0)	6 (40.0)	9 (60.0)	6 (40.0)	8 (53.3)	7 (46.7)	13 (86.7)	2 (13.3)	10 (66.7)	5 (33.3)	1 (6.7)	14 (93.3)
	p = 0.063		*p = 0.753*		*p = 1.000*		*p = 0.308*		*p = 0.722*		*p = 0.331*	

*statistically significant Fisher's exact test

There was a statistically significant difference between the median score for strategic learning (M=17.25, IQR=9.75-20.0) and deep learning approach (M=16.25, IQR=9.25-19.5) (p<0.0001). Similarly, strategic learning (M=17.25, IQR=9.75-20.0) and surface learning approach (M=12.25, IQR=6.5-16.75) median scores were significantly different (p<0.001) (Table II).

Table IV: Multinomial logistic regression model predicting students' learning approach relationship with demographic variables (N = 139)

	Deep ATL (AOR, 95% CI)	*p-value*	**Strategic ATL** (AOR, 95% CI)	*p-value*
Age				
≤25 years	1		1	
>25 years	6.8 (0.05 – 922)	*0.444*	6.9 (0.1 – 858.5)	*0.432*
Gender				
Female	1		1	
Male	8.3 (1.4 – 49.8)	*0.021**	5.2 (0.9 – 29.9)	*0.062*
Previous study				
A-level NS	1		1	
Diploma in Pharm.Tech.	1.1 (0.01 – 147.7)	*0.979*	1.9 (0.02 – 233.8)	*0.795*
Year of study				
Year 1	1		1	
Year 2	1.7 (0.1 – 37.0)	*0.740*	1.6 (0.1 – 30.5)	*0.740*
Year 3	0.7 (0.1 – 8.9)	*0.762*	0.2 (0.02 – 2.6)	*0.239*
Year 4	0.3 (0.02 – 3.1)	*0.289*	0.1 (0.01 – 0.7)	*0.023**

*AOR = Adjusted Odds Ratio, CI = Confidence Interval, Ref = Reference group, *statistically significant. ATL = Approach to Learning, NS = Natural Sciences, Pharm.Tech. = Pharmacy Technology. Surface Learning Approach was base outcome*

Students' learning approach

Among 147 pharmacy students assessed, the majority (67%) were predominantly strategic learners whereas only 25% were deep learners. Few students (7%) were surface learners (Table III). Students' learning approach was statistically significantly associated with course load (p=0.028) and programme stage (p=0.010). For instance, among strategic learners (n=99), the majority (84%) were taking more than five courses in the academic year and 60% were in the preclinical stage (that is, Year 1 and 2) of the B.Pharm. programme. Among sub-scales of strategic learning approach scale, median scores were highest for 'alertness to assessment demands' sub-scale (M=18, IQR=9-20). A Mann-Whitney test revealed a statistically significant difference between the underlying distribution of strategic learning approach median scores of students taking not more than five courses compared to those taking more than five courses in the academic year (p=0.0186). Similarly, among deep learners (n=37), 65% were in the clinical stage (that is, Year 3 and 4) of the B.Pharm. programme. Among the eleven surface learners, eight were in the clinical stage of the programme.

Male students were more likely to adopt a deep learning approach than female students (AOR=8.3, 95% CI: 1.4-49.8, p=0.021) after controlling for age, year of study and previous study (Table IV). Though not statistically significant (AOR=5.2, 95% CI: 0.9-29.9, p=0.062), strategic learning was five-times more likely among male students than female students. Similarly, despite not being statistically significant, relatively older students (>25 years old) were more likely to adopt deep learning (AOR=6.8, 95% CI: 0.05-922, p=0.444) and strategic learning (AOR=6.9, 95% CI: 0.1-859, p=0.432), respectively. Pharmacy students in Year 4 (final year) were 90% less likely to adopt a strategic learning approach (AOR=0.1, 95% CI: 0.01-0.7, p=0.043), after controlling for age, gender and previous study.

Teaching style preference

Table III shows that the majority of pharmacy students (67%, n=98) preferred teaching that involved lecturers transmitting information. Among the ASSIST sub-scales for teaching style preference, median scores were higher for 'transmitting information' (M=19, IQR: 9-20) than 'encouraging and supporting understanding' sub-scale (M=17, IQR: 9-20). Only 23% (n=33) preferred teaching styles that encouraged and supported understanding of learnt material. Few students (10%, n=15) preferred teaching styles that involved both transmitting information and encouraging understanding. Although the relationship was not statistically significant (rho=0.102, p=0.221), the majority (69%) of pharmacy students who were strategic learners (n=98) preferred teaching styles that involved lecturers transmitting information. Similarly, among female students aged below 25 years, including those taking more than five courses in the academic year, the majority also preferred teaching styles that involved transmitting information (Table III). When scores for teaching style preference scales (that is, 'transmitting information' versus 'encouraging and supporting understanding') were compared, Wilcoxon signed-rank sum test confirmed that the median score of 'transmitting information' was statistically significantly different from that of 'encouraging and supporting understanding' (p<0.001). Mann-Whitney test revealed a statistically significant difference between the median score for 'transmitting information' scale among female and male students (p=0.039) and for students enrolled on the B.Pharm. programme *via* the regular admission mode versus students admitted via parallel mode (p=0.030). Interestingly, there was no statistically significant association between students' teaching style preference and their approach to learning (p=0.085).

Discussion

Strategic learning was the dominant approach adopted by the majority of pharmacy students at UNZA. This implied pharmacy students were more inclined towards rote learning for purposes of achieving and merely 'passing' summative assessments to advance on the programme than focussing on understanding course material. Smith and colleagues also found little evidence of a preference for deep learning among Australian undergraduate pharmacy students (Smith *et al*., 2007). In related disciplines, strategic learning was reported as the predominant approach amongst the majority of undergraduate medical students in Singapore (Chonkar *et al*., 2018) and Colombo (Samarakoon *et al*., 2013). In Australia, Brown and colleagues also found a higher mean score for the strategic learning approach in male compared to female students on an introductory chemistry course (Brown *et al*., 2015).

This evidence further suggests that the learning approaches students adopt may be influenced more by the particular learning environment, pedagogical methods utilised by educators, types of assessment regimens administered, as well as individual student motivation for learning rather than the subject matter content within a particular discipline. Entwistle and colleagues described strategic learners as those with the tendency of second-guessing what examiners or markers look for when assessing students; and who concentrate on or allocate effort to studying just those bits of information sufficient to 'pass' examinations or assessments (Entwistle, McCune & Hounsell, 2002). The strategic approach to learning also reflects an important finding that students' approaches can vary depending on the learning tasks encountered and learning environment (Walker *et al*., 2010). Arguably, complex factors may be at play in influencing the dominance of strategic learning approach among pharmacy students at UNZA. Moreover, since more pharmacy students preferred teaching styles that largely involved transmitting information, this implied that they preferred passive learning. This is where lecturers tell them exactly what is important to note down, topics they should focus to read and where information can be learnt easily. Passive learning is also encouraged by assessment regimens which only need reproducing material provided in the lecture notes. These attributes are also somewhat related to surface learning (Entwistle *et al*., 2002). Recent evidence has shown that student-centred teaching and learning using exploratory and simulated (constructivist) approaches works better than expository (passive) lecture approaches (Frame *et al*., 2015) (Quintanilha, Costa & Coutinho, 2018). Based on the evidence from this study, the authors therefore argue that how students can attain meaningful learning as compared to how they are taught should become the focus of attention of pharmacy education in Zambia.

It was a cause of concern that only 25% of pharmacy students in the sample were deep learners and only 23% preferred teaching styles that encouraged and supported understanding of material learnt. The proportion of students adopting deep learning approach was relatively lower compared to findings in other settings and studies involving undergraduate pharmacy (Smith *et al*., 2010; Phanudulkitti *et al*., 2018), medical (Subasinghe & Wanniachchi, 2009) (Chonkar *et al*., 2018) and health science students (Walker *et al*., 2010; Mosca, Makkink & Stein, 2015). This could suggest that few students approached their learning and studying with the intention to understand for oneself or critically relate their knowledge to develop an understanding of pharmacy concepts. This finding may further suggest that few pharmacy students at UNZA preferred lecturers who encouraged them to think for themselves, assessments which allowed them to show how they thought about the material learnt, and courses where they are encouraged to read around the subject by themselves – all such attributes related to deep learning. Interestingly, whereas other studies (Halawi, McCarthy & Muoghalu, 2009; Phanudulkitti *et al*., 2018) found that female students had a higher likelihood of adopting deep learning, this study found that male students had higher odds of adopting deep learning than female students (AOR: 8.3, 95% CI: 1.4-49.8). The findings that more pharmacy students in higher academic years than in lower years on the programme adopted deep learning are consistent with other studies (Smith *et al*., 2010; Phanudulkitti *et al*., 2018). Mosca and colleagues, in their study, argued that academic workload and transition from high school to university education in South Africa were possible contributors to students' lack of preparedness to adopt deep learning in the early years of study on a medical programme (Mosca, Makkink & Stein, 2015). Whether this argument may similarly hold true in the Zambian setting is subject to further elucidation.

Another growing body of evidence seems to suggest that course workload and learning task demands on students influence their approach to learning. Varunki and colleagues found that pharmacy students who considered their course workload as appropriate and manageable tended to adopt deep learning (Varunki, Katajavuori & Postareff, 2017). Findings of this study correspond with this evidence. A statistically significant association was found between pharmacy students' learning approach and course load (p=0.028). Other evidence from literature links the importance of clear, well-structured and tailored instruction and learning activities to the attainment of deep learning among pharmacy students (Wang *et al*., 2015; Phanudulkitti *et al*., 2018). In pharmacy curriculum design and educational delivery, it is therefore imperative that student course workload and learning tasks are manageable, instructional content clear and well organised to promote deep learning and understanding of information taught.

Implications for educational strategies for pharmacy education

Pharmacists, as healthcare professionals, are expected to demonstrate competence, detailed understanding and application of pharmaceutical knowledge, skills and professionalism in their practice (FIP, 2014). Pharmacy education, teaching processes and educational strategies, including assessment methods, should therefore strive to promote deep learning and encourage understanding of material content among students (Ofstad & Brunner, 2013; Kuit & Fildes, 2014; Tsingos, Bosnic-Anticevich & Smith, 2015). Whereas a strategic approach to learning may seem advantageous to the student in the short-term, it encourages rote learning outcomes characterised by poor transfer and poor application of knowledge and skill in professional practice settings in the long term. Results from this study suggest that opportunity exists for educational interventions that can bring about positive changes in pharmacy students' learning approaches through curriculum change (Walker *et al*., 2010) and improving the learning environment (Ezeala, 2016; (Gruppen *et al*., 2018). Existing evidence has shown that it is possible to bring about small but significant positive changes in students' learning behaviour even in very large class sizes through curriculum change that mainstreams educational strategies promoting deep learning (Walker *et al*., 2010).

There are far-reaching benefits for utilising innovative educational strategies that promote deep learning. Entwistle and colleagues explain that students using a deep approach to learning adopt holistic thinking, that is, they start with an intention to understand for themselves, intellectually engage with the learning task and monitor the effectiveness of the learning as it progresses, linking new ideas to what they already know, and looking for recurring patterns and underlying principles (Entwistle, McCune & Tait, 2013). Deep learning approaches also enable them to adopt critical and serialist thinking (Entwistle, McCune & Tait, 2013). In other words, students develop abilities to check the evidence and relate it to the conclusions reached, and adopt a generally cautious, critical stance to what they are learning. Alternating between holist and serialist processes of thinking builds up personal understanding (Entwistle, McCune & Tait, 2013).

Evidently, the dominance of the strategic learning approach among pharmacy students may reflect issues associated with the course load in the curriculum, educational strategies and assessment methods employed in the training of pharmacists in Zambia. For instance, the majority of courses on the current B.Pharm. curriculum at UNZA utilise educational strategies that place considerable emphasis on the extent of content coverage (syllabus boundness) delivered through predominantly didactic lecture methods of teaching, including assessment regimes that largely favour students' reproducing knowledge considered sufficient to pass the course. In consonant with Bligh's argument, in as much as lectures may be the most popular and traditional pedagogical method and means of transmitting information (expository learning) in higher education today, the method is not as effective in promoting critical thinking, inspiring interest in the subject and teaching behavioural skills (Bligh, 2002). Similarly, Entwistle earlier argued that where the assessment regimes do not emphasise and reward personal understanding of concepts, surface strategic learning approaches may well dominate and prove adaptive (Entwistle, 2000). Evidence has also demonstrated that types of assessments such as selected response multiple-choice questions (MCQ) and short-answer recall questions tend to promote surface and strategic learning (Byrne *et al.*, 2002).

From the constructivist theory of learning (Hein, 1991), a broader set of indicators of students' learning approach and teaching preference are provided by the quality of teaching and the learning environment. This brings to the fore the styles of teaching, the role of the educator and academic quality in influencing students' approaches to learning. Trigwell, Prosser and Waterhouse provided evidence that higher levels of deep learning were demonstrated by students taught by lecturers, while surface learning approaches were more common when lecturers adopted more teacher-centred and information transmission approach to teaching (Trigwell, Prosser, & Waterhouse, 1999). Other evidence further suggests deep learning is encouraged by among other things: clear goals and anticipated outcomes of the learning tasks; teaching and assessment methods that foster active and long-term engagement with learning tasks; teaching that stimulates and focuses on the meaning and relevance of the subject matter; and opportunities to exercise responsible choice in the method and content of study (Walker *et al*., 2010). The authors contend that in order to promote and enhance deep learning among pharmacy students, pharmacy education programmes should consider mainstreaming student-centred educational strategies that encourage and support students' understanding of material taught, provide appropriate and manageable course workload, well-organised and clear instruction of class activities, appropriate assessment methods, including opportunities for students to engage published literature, and allowing student-centred interactive learning (Phanudulkitti *et al.*, 2018).

In order for Zambia's pharmacy education processes and curricula to transition students from strategic to active deep learners, a paradigm shift from focusing merely on teaching and transmitting information (input) to ensuring students attain meaningful learning (outcome) is necessary. This calls for, among other things, restructuring pharmacy curricula to enable it to adopt and promote student-oriented, deep learning approaches. As opposed to predominantly using expository lecture methods of teaching, innovative ways of facilitating learning such as problem-based learning (PBL), use of collaborative and peer instruction methods, conceptual change strategies, experiential and technology-enhanced learning within a largely constructivist educational philosophy (Michael & Modell, 2003) can be introduced in subsequent pharmacy curricula. This will also necessitate instituting changes in the educational environment and teaching styles, including the roles and skills of educators from just teaching (instructor and content focus) to facilitating deep learning (learner focus) (Michael, 2006).

Limitations and future work

Notwithstanding the study design being unable to establish causal relationships, establish temporality or track changes in approaches to learning and teaching style preferences, the findings provide a useful baseline upon which prospective and interventional studies to improve quality of student learning can be developed. In Zambia's pharmacy education setting, preliminary evidence from this study will be utilised to inform quality improvement interventions towards restructuring pharmacy curriculum delivery, assessment and educator practice so that quality of pharmacy education outcomes further improve. The authors look forward to undertaking further research in this area.

Conclusions

A strategic approach to learning with alertness to assessment demands and preference for teaching that involved transmitting information were predominant among the majority of pharmacy students in Zambia. Course load and programme stage were significantly associated with students' learning approach. Effects of such learning approach on pharmacy students' educational outcomes will be important to monitor and evaluate further. Educational strategies that promote and sustain meaningful deep learning among pharmacy students are therefore required.

Author Contributions

Conceptualisation: ACK and SSB conceptualised the study. ACK collected the data and undertook statistical analysis with DM and PK. Manuscript writing and internal review was undertaken by ACK, DM, PK, SZ, BA and SSB. Project administration was facilitated by GM and SSB.

Conflict of Interest Disclosure

All authors declare no conflict of interest associated with this work.

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Supplementary Materials and Data Availability

An anonymised dataset for this study is not publicly available but can be made accessible on reasonable request from the corresponding author.

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