

Access, pass, throughput and dropout rates: Review of a problem-based learning BPharm curriculum at a previously disadvantaged university in South Africa

L A Maboep, MSc (Biochemistry), MSc (Med); J C Meyer, BPharm, MSc (Med), PhD

Department of Pharmacy, Faculty of Health Sciences, University of Limpopo, Medunsa Campus, Pretoria, South Africa

Corresponding author: L A Maboep (lindi.zikalala@ul.ac.za)

Background. Students from diverse backgrounds increasingly enter higher education institutions. Universities need to ensure that their programmes are responsive to these diversities. In 1999, the University of Limpopo, Medunsa Campus, Pretoria, South Africa (SA), in partnership with Tshwane University of Technology, Pretoria, SA, introduced a holistic teaching and learning approach with regard to the problem-orientated, integrated, thematic, modular-based Bachelor of Pharmacy programme, which included a student support mechanism.

Objective. To present access, pass, throughput and dropout rates of students in the problem-based learning BPharm programme over the 14-year period since its inception.

Method. The records of all BPharm applicants and those admitted to the course from 1999 to 2008 were reviewed. Access, pass and throughput rates, and failure to complete the course, were determined for a cohort of students ($n=458$).

Results. All applications from 1999 to 2008 indicating pharmacy as first choice ($N=3\ 307$) were screened, with just more than half ($n=1\ 832$) of the applicants qualifying for the selection process. Twenty-five per cent ($n=458$), resembling SA's demographic racial group profile, were selected and entered the BPharm programme. From this cohort, the programme has produced 404 graduates (88.2%), with 74% completing the course in the minimum time of four years. The overall average pass rate for the 14-year period was 92.3%. Finances, personal challenges and exclusions were some of the reasons why students did not complete the course.

Conclusion. The problem-based learning pharmacy curriculum yielded good pass and throughput rates for a diverse group of students.

AJHPE 2014;6(2):133-137. DOI:10.7196/AJHPE.287



The Education White Paper 3, released in 1997, states that institutions of higher learning are faced with challenges 'to redress past inequalities and to transform the higher education system to serve a new social order, to meet pressing national needs, and to respond to new realities and opportunities'.^[1] Tertiary institutions in South Africa (SA) are therefore required to have initiatives in place to ensure that higher education is accessible to a diverse group of students.^[2] Students from diverse educational and socioeconomic backgrounds increasingly enter higher education – some with limited academic skills. Hence, universities have to be creative in the manner that they select students, facilitate learning, support students' needs, review curricula to meet pressing national needs, and respond to new realities and opportunities.^[3,4]

Furthermore, the traditional teaching curriculum tends to burden students by placing excessive emphasis on memorisation and information overload.^[4,5] Even though students acquire a substantial volume of knowledge, they often cannot apply it in practice when required.^[6] Problem-based learning (PBL) programmes focus more specifically on the outcomes that learners are required to achieve,^[7] although these programmes are not without shortcomings. A survey of medical students in 2005 at the University of Auckland, New Zealand, aimed to determine their confidence in basic science knowledge for safe medical practice. The results showed students being most confident in their behavioural science knowledge and least confident in their knowledge of pharmacology.^[7]

Since 1965, when PBL was introduced at McMaster University in Canada as an innovative teaching approach to stimulate students to construct the most appropriate solution,^[8] it has inspired many universities to implement PBL in their curricula. In PBL the learning process takes place when students are presented with real-life scenarios, which develop communication skills and provide opportunities for teamwork. Prior knowledge is activated and critical thinking skills are developed through brain-storming activities, discussion, problem-solving and collaborative learning.^[9,10] During this process, students acquire knowledge and find information through research, both occurring mainly without the presence of a teacher.^[11]

To respond to inequalities in the higher education system and the diverse population of students admitted to higher education programmes, curricula should be reviewed and developed accordingly.^[4] In SA, curriculum development should carefully consider student profiles, curriculum requirements, and institutional and community needs. Pharmacy education in most of SA institutions of higher education has been mainly didactic and subject-based, including a number of pure sciences. Over the past decade, the role of the pharmacist has shifted from being medication-centred to patient-centred.^[12] Pharmacy graduates are therefore expected to bring into practice their particular expertise, including knowledge, attitudes and skills, to solve problems together with other professionals and patients.

In response to the diversity of students applying to higher education institutions and the shift in the pharmacist's role, the University of Limpopo (UL), Medunsa Campus, Pretoria, SA, in partnership with Tshwane University

of Technology (TUT), Pretoria, SA, introduced an integrated, modular PBL Bachelor of Pharmacy (BPharm) programme in 1999.^[13,14] This article presents an overview of the access, pass, throughput and dropout rates of students in this programme.

The integrated, modular problem-based learning programme

The holistic UL, Medunsa Campus/TUT BPharm programme was introduced in 1999, with only 30 students.^[13,14] Admission to the programme at first-year level is through a selection process devised to include a diverse group of students and not solely based on academic merit. Minimum requirements for entry into the selection process are based on the following matriculation prerequisites: mathematics, physical science, biology/life sciences and English (from level 4; $\geq 50\%$) and/or prior learning in the health sciences. Applicants who meet these requirements are potentially invited for an admission assessment and a personal interview with two BPharm staff members.

The three abovementioned selection components (academic record, potential assessment and interview score) are weighted and a combined percentage score is calculated for each applicant. Applicants with the highest scores are selected, provided a minimum combined score of 60% is obtained. The final selection resembles SA's demographic racial group profile, with a limited number of foreign students being considered. There are a maximum of 60 places per year owing to limited capacity and resources within the Department of Pharmacy.

Transition from school to university is often associated with frustration, stress, lack of self-confidence and inability to cope, which may lead to failure and dropout.^[15] Another factor is that students come from a variety of home and educational backgrounds. The first module of the BPharm programme, known as Orientation and Induction, is designed to bring all students to a common starting point.^[14] They are familiarised with the goals and process of PBL through active engagement with PBL examples. Teaching and learning activities in this module are aimed at developing basic English proficiency, and computer, communication, interpersonal and life skills. The learning process is facilitated by trained staff members through interactive learning activities, e.g. workshops, role play, group discussions, oral presentations and practical experiences. Most teaching and learning in the BPharm programme takes place in small groups ($n \leq 10$), with students

equally distributed according to academic performance, maturity, gender and race. Groups change after each semester to encourage participant-directed and collaborative learning. Students are presented with a scenario or problem to solve or discuss according to the structured '7-jump process', facilitated by a trained staff member.^[13] The principles of the 7-jump process are taught to all students in the first module of the course and to new staff members during the induction phase.

Students are assessed by means of appropriate formative and summative assessment methods. Formative assessment tasks include short tests, quizzes, assignments, individualised and/or group oral assessments, and clinical workbook activities. Summative assessments include written examinations, objective structured practical examinations (OSPE), and integrated content examinations using problem-solving exercises. The programme also includes community-based service learning. Students reflect on their experiences through paper- or electronic-based course evaluations.

Students who are struggling academically are identified early in the programme, offered assistance and provided with a mentor, while those who face social and financial challenges are referred to the Centre for Academic Excellence and the Finance Department.

Method

A retrospective record review was conducted to collect data to determine access, pass, throughput

and dropout rates for a cohort of BPharm students ($N=458$). In terms of access, records (biographical background, school academic records) of all BPharm applicants from 1999 to 2008 were obtained from UL, Medunsa Campus Student Administration. Academic records (first to fourth year) of all students admitted to the BPharm programme (1999 - 2008) were obtained from the archive database, collated and reviewed in terms of pass rates, which had been validated and ratified by the examinations committee of the institution. Notes in student files were reviewed to identify reasons for dropout from the programme.

Throughput and dropout rates were determined for the cohort of students who enrolled between 1999 and 2008, and graduated between 2002 and 2012. Data relating to access, pass, throughput and dropout rates were analysed using descriptive statistics and expressed as frequency percentages and means. Permission to collate and publish the data was obtained from the respective departmental heads of the UL, Medunsa Campus, and TUT BPharm programmes.

Results

Access

The BPharm selection process consists of two phases (Table 1). From 1999 to 2008, applications ($N=3\ 307$) where pharmacy was indicated as first choice were screened. Just more than half of these applicants ($n=1\ 832$; 55.4%) met the minimum

Table 1. BPharm applications and selection (1999 - 2008)

Year	Applicants,* N	Phase 1: Minimum requirements met		Phase 2: Admitted to programme	
		n	As % of applications	n	As % of phase 1 selection
1999	210	146	69.5	30	20.5
2000	250	146	58.4	35	24.7
2001	310	185	59.7	44	23.8
2002	327	121	37.0	54	44.6
2003	300	186	62.0	38	20.4
2004	286	186	65.0	52	28.0
2005	275	196	71.3	55	28.1
2006	327	155	47.4	47	30.3
2007	465	207	44.5	51	24.6
2008	557	304	54.6	52	17.1
Total	3 307	1 832	55.4	458	25.0
Average	331	183	56.9	46	26.1

*Pharmacy indicated as first choice.

requirements for selection (Phase 1). These applicants entered the Phase 2 selection process and were invited for the potential assessment and personal interview. In total, 25% of students ($n=458$) who met the minimum requirements for selection were accepted into the programme over the 10-year period. Applicants who were admitted to the programme, as a proportion of those who entered the Phase 2 selection process, varied over the years, ranging from 17.1% (2008) to 44.6% (2002). Since the start of the BPharm programme in 1999, there was a steady increase in the number of applications received each year, with the exception of the period 2003 - 2005.

Gender and racial profile of selected students

The majority of students who were selected and registered for the UL, Medunsa Campus/ TUT BPharm programme (1999 - 2008) were black ($n=458$; 78%) (Fig. 1). Approximately two-thirds ($n=300$; 66%) were female. Non-SA students ($n=54$; 12%) in the programme were from Botswana, Swaziland, Lesotho, Zimbabwe, Tanzania, Zambia, Nigeria, Cameroon, Gabon, Malawi and Kenya.

Pass rates

The annual BPharm pass rates per level of study from 1999 to 2012 are shown in Table 2.

The pass rate is calculated as a percentage of students who passed all modules in a particular year. The annual average pass rate ranged from 86.1% (2009) to 97.7% (2003), with an overall

pass rate of 92.3% for the past 14 years. On average, the pass rates for first- and second-year students (90.2% and 89.7%, respectively) were slightly lower, but increased from second

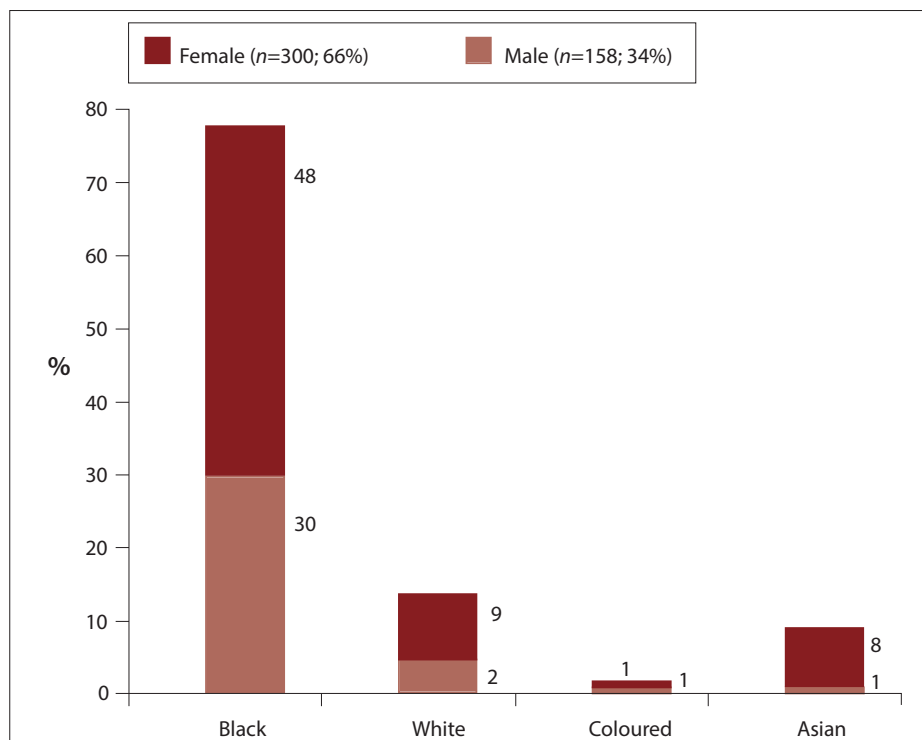


Fig.1. Gender and racial profile of selected BPharm students (1999 - 2008).

Table 2. Annual BPharm pass rates (1999 - 2012)

Year	Level/year of BPharm study								Annual average pass rate, %
	1		2		3		4		
	Passed/ examined	Pass rate, %	Passed/ examined	Pass rate, %	Passed/ examined	Pass rate, %	Passed/ examined	Pass rate, %	
1999	29/30	96.7	-	-	-	-	-	-	96.7
2000	32/36	88.9	29/29	100.0	-	-	-	-	94.5
2001	43/46	93.5	30/32	93.8	28/29	96.6	-	-	94.6
2002	54/57	94.7	37/44	84.1	30/31	96.7	28/28	100.0	93.9
2003	40/40	100.0	56/60	93.3	36/37	97.3	30/30	100.0	97.7
2004	49/52	94.2	37/39	94.9	54/56	96.3	34/36	94.4	95.0
2005	44/54	81.5	45/49	92.0	39/41	95.0	54/55	98.2	91.7
2006	48/54	89.0	37/48	77.0	41/45	91.0	38/39	97.4	88.6
2007	48/53	90.6	53/56	94.6	38/40	95.0	40/41	97.6	94.5
2008	46/56	82.1	40/48	83.3	53/55	96.4	38/39	97.4	89.8
2009	57/70	81.4	46/53	86.8	32/40	80.0	52/54	96.3	86.1
2010	54/63	85.7	54/63	85.7	46/55	83.6	34/34	100	88.8
2011	52/61	85.2	55/60	91.9	57/62	91.9	44/46	95.7	91.2
2012	68/69	98.6	50/56	89.3	56/60	93.3	53/59	89.8	92.8
Average		90.2		89.7		92.8		96.6	
Overall average pass rate									92.3

to third (92.8%) and again from third to final (96.6%) year.

Throughput and dropout rates

Table 3 shows that the selection process allowed various racial groups to access the 4-year full-time BPharm programme. From the 1999 - 2008 student intake, it produced 404 graduates (88.2%) from the total number of students admitted ($n=458$) who met the exit-level competencies required by the SA Pharmacy Council. Approximately three-quarters (74%) of these students completed the course in the minimum period of four years, while 13.7% took an additional 1 - 2 years. Two students (0.4%) successfully appealed against academic exclusion from the programme and completed the course in seven years. Twelve students (2.6%) are still in the programme, of whom three interrupted their studies at some stage, while the other nine students failed a year and are therefore in their fifth year of study.

Forty-two (9.2%) of the students admitted during 1999 - 2008 dropped out of the programme. Of these, three died, one changed to a medicine programme after completion of the first year, and one dropped out owing to academic exclusion. Other reasons for dropout, as noted in students' files, included financial constraints, personal reasons, voluntary withdrawal owing to failure, and difficulty of the course. The dropout rate was proportionally highest among white students.

Discussion

In general, the number of applicants for the BPharm programme increased over the years. Although this programme is becoming more popular among matriculants, approximately half of all applications did not meet the basic requirements to enter the second phase of the selection process. Secondary schools should guide learners to prepare themselves better for careers that interest them, or assist them in applying for programmes for which they qualify. Applicants might meet the minimum selection requirements, but the BPharm programme has a limited number of places for new students owing to a lack of human resources and infrastructure. This situation is unfortunate because pharmacy has been identified as a scarce skills component and there is already a shortage of pharmacists in SA.^[16]

The UL, Medunsa Campus/TUT BPharm selection considers SA's demographic represen-

Table 3. BPharm throughput according to race: Intake 1999 - 2008

	Black	White	Coloured	Asian	Total
Total entered, <i>n</i> (%)	359 (78.4)	52 (11.4)	7 (1.5)	40 (8.7)	458 (100)
Completed					
4 years, <i>n</i> (%)	268 (74.7)	38 (73.1)	6 (85.7)	27 (67.5)	339 (74)
5 years, <i>n</i> (%)	38 (10.6)	5 (9.6)	1 (14.3)	7 (17.5)	51 (11.1)
6 years, <i>n</i> (%)	9 (2.5)	1 (1.9)	0	2 (5)	12 (2.6)
7 years, <i>n</i> (%)	2 (0.6)	0	0	0	2 (0.4)
Total, <i>N</i> (%)					404 (88.2)
Still in programme	11 (3.1)	0	0	1 (2.5)	12 (2.6)
Dropout	31 (8.6)	8 (15.4)	0	3 (7.5)	42 (9.2)

tation profile, but the programme does not attract many white, Asian and coloured students. This could be attributed to UL, Medunsa Campus, still being viewed as a campus for black South Africans, as in the pre-1994 years. Recognition of prior learning related to the healthcare sciences gives mature applicants an opportunity to enter the course.

When viewing the pass rates for the 1999 - 2008 cohort of BPharm students at UL, Medunsa Campus/TUT, the overall average pass rate increased in the third (92.8%) and fourth (96.6%) years compared with the first (90.2%) and second (89.7%) years of study. The lower pass rates in the first two years could be the result of factors other than academic performance. From the literature it is evident that adjustment to university is of great concern in terms of intellectual and personal discoveries, independence in thought and behaviour, widening of horizons and growth in confidence.^[17,18] The university experience can lead to failure, loss of confidence and possibly disillusionment,^[19] especially during the first years of study.

The UL, Medunsa Campus/TUT BPharm programme, with its successful implementation of the PBL approach, stringent selection process and assessment methodology, maintained high pass rates during its first 14 years. This programme appears to be successful in addressing the educational needs of the students selected for the course. Interventions to support students are necessary to maintain good pass rates.

Conclusion

The selection process of the UL/TUT BPharm programme is based on three criteria (academic performance and prior learning, potential test and personal interview), with final selection

representing the demographics of the country. This process provides an opportunity for a diverse group of students to access the programme and is not based on academic achievement only.

The use of PBL in the BPharm programme has been successful in achieving good pass and throughput rates over the past 14 years.

Recommendation

The lower pass rates in the first two years of study, reasons for dropout and students not completing the degree in the minimum of four years, call for future investigation and subsequent relevant interventions.

Limitations

This article is based only on the cohort of BPharm students at UL, Medunsa Campus/TUT, and no comparisons are made with students in other programmes or from other universities.

Acknowledgements. The authors would like to thank Ms M Zweygarth for maintaining the BPharm database; Prof. Anthea Rhoda for guidance and assistance with preparation of the manuscript; the 1999 - 2008 BPharm students; staff from the Department of Pharmacy, UL, Medunsa Campus, and the Department of Pharmaceutical Sciences, TUT, for their contribution to the success of the programme; heads of department for permission to access the BPharm archive database; and the Director of the School of Health Care Sciences and UL Women's Academic Solidarity Association (ULWASA) for organising writing sessions for academic staff.

References

1. Council on Higher Education (CHE). Education White Paper 3: A Programme for the transformation of Higher Education, 1997. <http://www.che.ac.za/documents/d000005/index.php> (accessed 30 April 2013).

2. Council on Higher Education (CHE). Improving Teaching and Learning (ITL) Resources, 2004. <http://www.ch.ac.za/documents/d000087> (accessed 30 April 2013).
3. Fraser W, Killen R. Factors influencing academic success or failure of first-years and senior students: Do education students and lecturers perceive things differently? *South African Journal of Education* 2003;23(4):254-260.
4. Amosun SL, Hartman N, Janse van Rensburg V, Duncan EM, Badenhorst E. Processes in widening access to undergraduate allied health sciences education in South Africa. *African Journal of Health Professions Education* 2012;4(1):34-39. [<http://dx.doi.org/10.7196/AJHPE.138>]
5. Dornhorst AC. Information overload: Why medical education needs a shake-up. *Lancet* 1981;2(8245):513-514.
6. Brown B, Skau K, Wall A. Learning across the curriculum: Connecting the pharmaceutical sciences to practice in the first professional year. *Am J Pharm Educ* 2009;73(2):36.
7. Insull P, Blyth P. Basic science confidence in senior medical students from the University of Auckland, New Zealand: Results of the 2005 Senior Students Survey. *N Z Med J* 2006;119(1247):U2364.
8. Barrows HS, Tamblyn RM. *Problem-Based Learning: An Approach to Medical Education*. New York: Springer, 1980.
9. Karimi R. Interface between problem-based learning and a learner-centered paradigm. *Adv Med Educ Pract* 2011;2:117-125. [<http://dx.doi.org/10.2147/AMEPS12794>]
10. Steck TR, DiBiase W, Wang C, Boukhtiarov A. The use of open-ended problem-based learning scenarios in an interdisciplinary biotechnology class: Evaluation of a problem-based learning course across three years. *J Microbiol Biol Educ* 2012;13(1):2-10. [<http://dx.doi.org/10.1128/jmbe.v13i1.389>]
11. Visconti CF. Problem-based learning: Teaching skills for evidence-based practice. *Perspectives on Issues in Higher Education* 2010;13(1):27-31. [<http://dx.doi.org/10.1044/ihe13.1.27>].
12. Kiersma ME, Plake KS, Newton GD, Mason HL. Factors affecting prepharmacy students' perceptions of the professional role of pharmacists. *Am J Pharm Educ* 2010;74(9):161.
13. Enslin G. A closer look at BPharm programmes University of Limpopo (Medunsa campus) and Tshwane University of Technology. *S Afr Pharm J* 2008;75(9):16. <http://www.sapj.co.za/index.php/SAPJ/article/download/453/415> (accessed 10 December 2012).
14. Summers RS, Haavik C, Moola F, Lowes M, Enslin G. Pharmaceutical education in the South African multicultural society. *Am J Pharm Educ* 2001;65:150-154.
15. Levy S, Earl C. *Student Voices in Transition: The Experiences of Pathways Students*. Hatfield, Pretoria: Van Schaik, 2012.
16. South African Pharmacy Council. *Pharmacy Human Resources in South Africa*. Pretoria: SAPC, 2011. <http://www.e2.co.za/emags/phrsa/pageflip.html> (accessed 12 December 2012).
17. Singaram VS, Dolmans DHJM, Lachman N, van der Vleut CPM. Perceptions of problem based learning (PBL) group effectiveness in a socially-culturally diverse medical student population. *Educ Health* 2008;21(2):116.
18. Davidowitz B. Infusing adjustment issues into the curriculum in a science foundation programme. In: Leibowitz B, Van der Merwe A, Van Schalkwyk S, eds. *Focus on First-Year Success. Perspectives Emerging from South Africa and Beyond*. Stellenbosch: SUN MeDIA, 2009:195-208.
19. Scott I. First-year experience as terrain of failure or platform for development. In: Leibowitz B, Van der Merwe A, Van Schalkwyk S, eds. *Focus on First-Year Success. Perspectives Emerging from South Africa and Beyond*. Stellenbosch: SUN MeDIA, 2009:17-36.