

Benefits of curriculum renewal: The Stellenbosch University physiotherapy experience

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Background. Driven by a changing healthcare environment, the Division of Physiotherapy (Stellenbosch University) reduced core content and adopted a multimodal approach to teaching and learning. The benefits of curriculum renewal, however, are seldom investigated despite ongoing internal appraisal. Evaluation of the BSc Physiotherapy programme was considered incomplete without determining the worth of the programme.

Objectives. To determine whether there was a change in students' perception of the impact of the programme on personal development; and whether the programme prepared them for community service.

Methods. A descriptive comparative desktop analysis was conducted in which the data from the Faculty's Programme Evaluation process were compared between students enrolled in the old curriculum (2006) and students enrolled in the new curriculum (2011) using pooled data and *t*-tests to compare responses between the two groups. A level of significance was set at $p < 0.05$.

Results. A significant increase in scores was noted for various graduate attributes developed as a result of the programme, such as critical thinking, clinical reasoning, communication and sourcing information ($p < 0.01$). Similarly, students scored their perceptions related to programme structure significantly higher ($p < 0.01$). No change was reported regarding students' ability to maintain a balance between studies and other activities. Scores pertaining to their perception of readiness for community service or professional practice remained the same with both cohorts believing they were well prepared.

Conclusion. The renewed format seemed to benefit students greatly in assisting the development of graduate attributes. Students were significantly more satisfied with the structure of the renewed curriculum and – despite extensive changes – the principles-based multimodal approach to teaching and learning was perceived as effective for preparing students for community service. Programmes undertaking curriculum renewal should not only focus on the curriculum content but also develop a variety of learning opportunities to facilitate the development of graduate attributes. The next cycle of evaluation should however reflect on clinical practice.

AJHPE 2014;6(2 Suppl 1):222-226. DOI:10.7196/AJHPE.519



Curriculum renewal in health education is not novel. Educational institutions have an ethical obligation to produce quality graduates capable of addressing their communities' healthcare needs. However, a worldwide ongoing change in the profile of disease with resultant increase in burden on

personal and government resources means that health education programmes need to change. These programme changes should not just occur at content level but should also consider the changing profile of the undergraduate student which is affecting their readiness for tertiary level education.^[1] Programme evaluation is therefore essential not just for ensuring effective and fiscally responsible use of government resources, but should also evaluate the impact change on the student stemming from this curriculum renewal.

Background

In 2007 a renewed physiotherapy curriculum was implemented at Stellenbosch University (SU) which aimed to meet these multiple challenges but still produce graduates capable of independent practice in a community setting. Although the scope of physiotherapy practice is rapidly expanding, the undergraduate programme was forced to cut back on content and students' critical reasoning, problem-solving and managerial skills needed to improve. The profile of an SU physiotherapy graduate was revisited, and a new, more appropriate and flexible curriculum was developed which aimed to assist the development of manual skills while developing skills of reflection, communication, information gathering and critical analysis,

safety, group work (team, organisation and community), evidence-based practice, professionalism, problem solving, ethical practice and lifelong learning. This skills set was aligned with the graduate attributes identified by the Faculty of Medicine and Health Sciences (FMHS), SU.

A phronetic approach was taken in that the process followed for curriculum renewal was predominantly based on craft knowledge^[2] and relied in most part on the intuitiveness of the current staff, none of whom had a formal background nestled in education. The framework that guided the process closely follows that of an instructional systems design using the ADDIE model (analysis, design, develop, implement/delivery & evaluation).^[3] A SWOT analysis was used to identify the strengths, weaknesses, threats and opportunities of the changing learning and healthcare environment; a nominal group technique^[4] was used to identify core content; and a survey of the literature guided decisions regarding best practice methods of teaching and learning.

The end product

The end product of the above process was a newly constructed physiotherapy undergraduate curriculum. The curriculum consists of four phases:

Phase 1. This forms the scientific foundation for the practice of physiotherapy which is laid down in the first 18 months of the programme (years 1 and 2).

Phase 2. Over the next 12 months there is a gradual integration of pathology and environmental factors into the science of physiotherapy and the early development of clinical reasoning skills (years 2 and 3).

Phase 3. This phase is focused on refining clinical reasoning skills (years 3 and 4).

Phase 4. This phase can be viewed as pre-profession entry with increasing emphasis on autonomy and reflection (year 4).

The learning opportunities and teaching methods used were aligned with the outcomes of each module. A wide variety of formats for the presentation of content were selected. These included lectures, discussions, group work, self-study and experiential learning.^[5] Didactic (lectures), small-group

Table 1. Summary of teaching and learning events: A comparison between the old and new curricula

Year	Old curriculum		New curriculum		Anticipated benefits
	Learning events	Assessment	Learning events	Assessment	
1	Lectures	Theory paper (short Qs)	Lectures	Theory paper (short Qs)	↑ Knowledge base
	Practical skills training	OSPE	Practical skills training	OSPE	
2	Lectures	Theory paper (short Qs)	Lectures	Written integrated theory tests (basic level – body areas and systems based)	↑ Knowledge integration
	Practical skills training	Practical tests (1 hr case-based)	Practical skills training	OSPE	
	WPBL	Nursing elective	WPBL	Clinical patient interviews; nursing elective, task: ethics and understanding health services; observational review	
3	Lectures	Theory paper (short Qs); development of a research proposal	PBL	MCQs; written integrated theory tests; development of a research (systematic review) proposal	↑ Clinical reasoning ↑ Awareness for evidence-based practice ↑ Patient-centeredness ↑ Multidisciplinary approach Think critically Progressive mastery of technical skills
	Practical skills training	Practical tests (1 hr case-based)	Practical skills training and case-based skills training (skills lab)	DOPS	
	WPBL	Treatment of a known patient and evaluation of an unknown patient, block reports	WPBL	Treatment of known and evaluation of unseen patients; block reports; DOPS	
4	Lectures	Theory paper (short and long Qs)	EBL	Tasks (case-based); self-development of an evaluation form; presentations; MCQs; written integrated theory tests	Promote clinical reasoning Source relevant evidence-based literature Source relevant literature ↑ Critical thinking ↑ Health advocacy Teacher
	WPBL	Treatment of a known patient and evaluation of an unknown patient	WPBL	Treatment of known and evaluation of unseen patients; block reports; DOPS; tasks (management, human rights, reflection and referral letter) and submit a portfolio; service learning project presentations	
	Primary research project	Mini-thesis	Systematic review	Article	

Q = question; OSPE = objective structured practical exams; WPBL = workplace-based learning; PBL = problem-based learning; MCQs = multiple choice questions; DOPS = direct observational procedural skills; EBL = enquiry-based learning.

problem-based (PBL)^[6] and enquiry-based (EBL)^[7] learning approaches are used to deliver prescribed knowledge; practical training sessions and a near-peer tutorial system^[8] are used to teach and practise manual evaluation and treatment techniques prior to entering the clinical 'real world' setting for continuous experiential learning. Both horizontal and vertical scaffolding of complexity in theory training was achieved by gradually progressing from basic knowledge related to a singular body structure to integrated theory and complex pathology case presentations to workplace-based learning (WPBL)^[9] opportunities.

Assessment should be constructively aligned with the teaching and learning opportunities and so a similar multimodal approach to assessment was adopted (Table 1). Practical skills development progresses from training and objective structured practical exams (OSPEs) performed on peers^[10] to technique tests (direct observational procedural skills (DOPS)^[11] performed on patients; to patient evaluation and treatment in the clinical environment (Table 1). A method of continuous assessment was employed.

This bold change to the traditional format of teaching and learning employed by most of the eight physiotherapy programmes offered in South Africa (SA) required careful and close monitoring to ensure successful delivery, as well as ensuring ongoing development of this curriculum. To this end several internal audits by module coordinators (lecturers) were conducted to determine effect and perceptions of selected aspects of the 4-year degree programme. These allowed for identification of problem areas; amendments, where necessary, were made. Reports from the SU Centre for Teaching and Learning (CTL)^[12] regarding lecturer, module and (at the end of their degree programme) programme evaluation, together with the internal audits, provided information as to content, presentation and perceived enjoyment.

It was important to ensure that the division's throughput rate of 98% was maintained. The question remained, however, as to whether the renewed curriculum, regardless of reduced core content, which has a strong self-directed learning focus, would be perceived by students to have a significant effect on personal development and still be effective for preparing students for professional practice within the SA context.

Methods

A descriptive comparative desktop analysis was conducted in which the data from the Faculty of Medicine and Health Sciences Programme Evaluation process were compared for two BSc Physiotherapy cohorts. Responses from students enrolled in the old curriculum (2006) were compared with responses from students enrolled in the new curriculum (2011).

CTL annually invites all final-year physiotherapy students to anonymously complete a paper-based programme evaluation feedback questionnaire at the end of their final academic year before their results are made known. The questionnaire has three sections aimed at obtaining information on: the extent to which the programme outcomes have been achieved; programme architecture; and programme (physiotherapy)-specific outcomes (Table 2). All 30 questions require response on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The first 10 questions assess whether the students feel that the programme empowered them across a wide range of generic skills including critical thinking, problem solving, taking responsibility for learning, working in a team, etc. The next 10 questions pertain to programme architecture in terms of communication, appropriateness of evaluation methods, structure, etc. The last 10 questions were more specifically related to physiotherapy; however, the responses to

only two of these questions were deemed appropriate for analysis in this study, and pertained to whether the programme encouraged evidence-based practice and whether the programme prepared them sufficiently for their compulsory community service year.

The questionnaire is handed out by an independent member from CTL to all students at the end of their last contact session with lecturers. All assessments, including the final professional clinical entry examination, have been completed by then.

Statistical analysis

For each of the 22 selected questions, CTL reports the feedback as an average mark for the year group on a continuum of 1 - 5 which varies between 'strongly disagree' to 'strongly agree'. These data were then analysed in Statistica (version 11) in consultation with a statistician using pooled data and *t*-tests to compare responses between the two groups. A level of significance was set at $p < 0.05$.

As this was an internal audit, ethical approval was not required. Individual questionnaires were not reviewed and students could therefore not be identified.

Results

Responses from 36/41 (87.7%) graduates enrolled in the old curriculum (2006) were compared with responses from all 38 (100%) graduates enrolled in the new curriculum. Responses differed significantly between the two groups, with the students following the new curriculum reporting higher mean values for most of the questions or statements (Table 2). This was so for perceptions related to personal gain/development, as well as those regarding the quality of the programme.

No improvement in their ability to balance their studies and other activities (Q7, Table 2) was noted. Questions 19 and 21 are similar and relate to students' readiness for future professional practice; no differences in scores between the two groups were found. For the 2011 cohort an average score of 4 is reported compared with an average score of 3.8 for the 2006 cohort.

Regarding the statement 'If I were to start again I would follow the same programme', no improved rating was found.

Discussion

Within our division we view programme evaluation as crucial for both accountability and development of learning. The findings of this desktop analysis suggest that the renewed curriculum was successful in maintaining students' perception of their readiness for professional practice. The improved rating scores relating to perceptions of graduate attributes and programme design were very encouraging. The renewed curriculum produced students who rated themselves significantly higher than students enrolled in the old curriculum, especially those scores related to critical thinking (Q1) and clinical reasoning (Q2, 3 & 5), communication (Q6) and self-directed learning (Q8). Students also seemed more aware of the principle of evidence-based practice (Q21) and were able to function effectively as part of a multidisciplinary team (Q4). Similarly, various aspects of the programme architecture (Q11 - 18) were more positively rated by students in the new curriculum.

To qualify as programme evaluation, it is argued that the programme must focus on either outcome (in this case, did students perceive the programme to have an impact on personal development and their perception of

Table 2. Analysis of responses to Centre for Teaching and Learning's Programme Evaluation questionnaire (SU BSc Physiotherapy 2006 v. 2011)

Questions	2006 average* (SD)	2011 average* (SD)	Pooled SD	t	p
A. The programme empowered me to:					
1. Think critically	3.92 (0.72)	4.68 (0.52)	0.1467	-5.181	<0.001
2. Solve problems reasonably	4.03 (0.64)	4.66 (0.53)	0.1370	-4.598	<0.001
3. Keep the bigger picture in mind when solving problems	3.97 (0.6)	4.61 (0.54)	0.1329	-4.814	<0.001
4. Work effectively with others as a member of the team	4.03 (0.83)	4.68 (0.46)	0.1572	-4.135	<0.001
5. Collect, analyse, organise and evaluate information	3.83 (0.76)	4.53 (0.6)	0.1597	-4.382	<0.001
6. Communicate effectively using language skills (orally & in writing)	3.78 (0.89)	4.63 (0.58)	0.1757	-4.839	<0.001
7. Manage myself and my activities effectively in such a way that I maintain a good balance between my studies and other activities	3.36 (1.06)	3.39 (1.14)	0.2558	-0.117	0.45
8. Take responsibility to acquire knowledge and skills	4.17 (0.7)	4.5 (0.72)	0.1651	-1.999	0.02
9. Be culturally sensitive	3.82 (0.78)	4.55 (0.59)	0.1614	-4.522	<0.001
10. Identify and explore opportunities in educational, career and business world	3.31 (0.84)	3.68 (0.65)	0.1753	-2.111	0.02
B. State whether you agree with the following statements:					
11. Programme outcomes were communicated to me clearly	3.17 (0.73)	4.13 (0.86)	0.1851	-5.186	<0.001
12. I achieved the programme outcomes	3.5 (0.55)	4.24 (0.7)	0.1460	-5.071	<0.001
13. The assessment methods and criteria are appropriate and match the programme outcomes	3.0 (0.94)	3.68 (1.08)	0.2351	-2.894	<0.001
14. The content of the programme is clearly aimed at a clearly identifiable profession	3.81 (0.74)	4.21 (0.92)	0.1936	-2.066	0.02
15. The modules in the programme form a meaningful unit	3.42 (0.86)	4.16 (0.63)	0.1760	-4.204	<0.001
16. The programme is organised in such a way that knowledge and understanding have deepened from the first to the final year	4.36 (0.71)	4.58 (0.59)	0.1522	-1.446	0.08
17. Little unnecessary duplication occurs between modules	3.67 (0.85)	3.87 (0.77)	0.1889	-1.059	0.15
18. The programme is in line with contemporary knowledge	3.89 (0.92)	4.32 (0.61)	0.1825	-2.357	<0.001
19. The programme prepared me for the working environment	3.91 (0.650)	4.11 (0.79)	0.1678	-1.192	0.12
20. If I were to start again I would follow the same programme	3.31 (1.09)	3.43 (1.39)	0.2896	-0.414	0.34
C. Physiotherapy-specific questions. State whether you agree with the following statements:					
21. The curriculum enhances the importance of science as support for the practice of the profession	3.76 (0.84)	4.39 (0.71)	0.1813	-3.475	<0.001
22. I feel adequately prepared for my community year	3.74 (0.6)	3.89 (0.75)	0.1575	-0.952	0.17

* Pooled statistics from a 5-point Likert scale rating where 1 = strongly disagree to 5 = strongly agree. Degree of freedom (df) = 72.

readiness for independent practice?), outputs (student grades or number of students graduating) or administration^[13] (effect of processes followed). It is however our opinion that all three aspects are important for ensuring client satisfaction while maintaining standards and producing effective, independent first-line practitioners. While the primary focus of this paper is to describe the outcome related to students' perceptions of self-development and readiness, throughput rate and students' final marks were also observed and evaluated. There was no significant change in the distribution of marks. The throughput rate for the 2006 cohort was 100% and the throughput rate has since been maintained at 98%.

It was our assumption that potentially negative effects of reducing core content and changing the approach to teaching this core content would become evident during the clinical rotations. Although the structure and format of student supervision and support had to change, it was the opinion of the external examiners following the clinical physiotherapy exit exam that

utilising a wide range of assessment methods contributed not only to patient evaluation and treatment skills, but also to producing critical thinkers and innovative students.

The relatively low and unchanged score relating to the question: 'would you follow the same programme' was disappointing. It was hypothesised that the multimodal approach^[14] would be welcomed by students, and with the increasing number of assessment opportunities students would perceive the system to be more reflective of their potential.^[15] Potential contributing factors such as personal factors including career choice, individual learning style and personality factors were not investigated. *Post hoc* subgroup analysis of individual responses may have identified relationships between these factors and perceived 'likeness' of the renewed teaching and learning approach.

Although not evident from the above results, the programme is extremely busy and despite the nature of problem-based and enquiry-based learning allowing for many non-contact hours, students still find it difficult to

balance their studies with other activities. Participation in extracurricular activities is promoted at tertiary institutions and colleges in order to develop leadership, communication and time-management skills;^[16] however, the physiotherapy students at SU seem to continue to struggle with time management and effective study methods. The 'I can do it all' mentality of peak performing students who embark on multiple academic, sport and social activities but have poor personal time management and inability to prioritise may be reasons for this. This was however not explored in this paper.

This study has several limitations, ranging from questionable timing to appropriateness of the group data analysis. It is clear from the group SD that there was wide variable response to some of the questions/statements and a more in-depth subgroup analysis of individual responses may have provided opportunity for investigating factors other than curricular influences. Ethically, however, access to individual responses was not possible. Another limitation is that this paper reports on the outcome of the CTL Programme Evaluation of the first cohort of physiotherapy students only. Comparison with more recent cohorts will provide more reliable interpretation of the outcome of the renewed curriculum. The invitation to participate was issued prior to obtaining their results, which may have influenced their scoring; however, as this effect could have gone both ways, in that students typically either under- or overestimate their performance, it was considered a negligible effect. To accurately be able to judge whether this curriculum was effective in preparing students for their role as independent practitioners ready for community service, remains difficult. Follow-up 6 or 8 months into their community service year is recommended.

Conclusion

Changing the content and the teaching and learning events had a significant impact on students' perception of their ability to: evaluate and treat clients;

work effectively within a team; source information; and identify and explore opportunities in education, career and in business. Students felt prepared and ready for community and professional practice. Programmes undertaking curriculum renewal should not only focus on the curriculum content, but also develop a variety of learning opportunities to facilitate the development of graduate attributes. Ongoing evaluation and increasing student support regarding time management and study methods is recommended. The next cycle following graduation should reflect on clinical practice.

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