Learning style preferences in an undergraduate optometry programme in South Africa

D Chetty, BOptom; **F S Dubazane,** BOptom; **C Lafitte,** BOptom; **Z Ndwandwe,** BOptom; **F Z Rauff,** BOptom; **P Sibiya,** BOptom; **A Tembe,** BOptom; **N Gcabashe,** BOptom, MOptom; **N Rampersad,** BOptom, MEd, PhD

Discipline of Optometry, School of Health Sciences, University of KwaZulu-Natal, Durban, South Africa

Corresponding author: *N Rampersad (rampersadn@ukzn.ac.za)*

Background. Knowledge of learning style preferences is important for decisions related to teaching and learning. Even though data on learning style preferences are available in the literature, limited information is available about these preferences in optometry students in South Africa (SA).
Objective. To explore the learning style preferences in an undergraduate optometry programme.
Methods. The study used a quantitative research design and online questionnaires for data collection. The Index of Learning Styles questionnaire was used to assess learning style preferences. Data were analysed with descriptive and inferential statistics, where $p<0.05$ was considered statistically significant.
Results. Overall, 159 students completed the anonymous questionnaires. Most of the students were black (n=111), <21 years of age (n=83) and in their third year of study (n=53). The majority of students showed a balanced preference (between 47% and 65% for the different learning style dimensions). There was no significant association between demographic characteristics (gender and level of study) and learning style preferences.
Conclusion. Optometry students have balanced learning styles. This information can be used by stakeholders responsible for optometry education in SA to better inform curriculum review endeavours and decisions related to teaching and learning. The information would be essential to make the educational environment contextually relevant and conducive to student learning.

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Optometry education has changed during the last few decades, prompted by expansion in scope of practice, development in information technology, and the need for eye care professionals to incorporate evidence-based care into professional practice.[1-3] Despite differences in the models of optometry education globally, optometrists function as primary healthcare practitioners who provide comprehensive eye and vision care services.[1] Optometry curricula consist of theory, as well as preclinical and clinical elements that are essential to the development of competent optometrists fit for professional practice. The key components in any curriculum include learning outcomes, assessment, feedback, evaluation and teaching and learning materials and experiences.[4,5] Although there are many widely accepted learning theories, an important feature of the learning process relates to the interactions between students, teachers and the educational environment within which these interactions take place.[5]

Studies have reported on the learning styles of students in health-related[6-8] and non-health-related[9] disciplines. There may be interest in learning styles because of increased awareness of student diversity and for educational practices to acknowledge and be responsive to this diversity.[10-12] Consequently, curriculum planners and teachers have identified the need to improve the understanding of students' learning styles and use this information to improve the curriculum during appraisal endeavours.[13] Few studies have reported on the learning styles of optometry students.[8,14-18] With the exception of one study on the learning styles of optometry students conducted at a South African (SA) university,[14] all other studies have been undertaken at international optometry programmes.[8,15-18] Consequently, the aim of this study was to explore the learning style preferences in an undergraduate optometry programme in SA. In this way, the study responds to the call for greater focus on the learning styles of students in developing countries.[19]

Methods

The study used a quantitative design to describe the learning style preferences of optometry students. The study population included all optometry students registered for the 2021 academic year in the Discipline of Optometry at the University of KwaZulu-Natal (UKZN). Participants <18 years of age who were not registered at UKZN at the time of the study were excluded. At the time of data collection, there were 240 eligible optometry students at UKZN. The study used a saturated sample, as all students were invited to participate in the study through a link sent via the WhatsApp social platform to class groups.

Data were collected using an online self-administered anonymous questionnaire created through Google Forms and available from 14 August to 10 October 2021. The online questionnaire took ~10 - 15 minutes to complete and consisted of three sections. Section 1 contained the study information and consent to participate, section 2 contained questions related to demographic information and section 3 contained the questions in the Felder-Soloman Index of Learning Styles (ILS) questionnaire to assess learning style preferences.

The ILS questionnaire, which was developed by Felder and Soloman, was used to assess the learning style preferences of optometry students. This questionnaire consists of 44 statements that cover four learning style dimensions related to the way information is received and processed.[20] Active-reflective, sensing-intuitive, visual-verbal and sequential-global dimensions are included, with 11 forced-choice statements for each dimension.[9,21] The active-reflective dimension describes the way in which students prefer to process information and may be either actively through discussion with others or reflectively through introspection.[9,20] The sensing-intuitive dimension describes the type of information that

students prefer to perceive and may be either sensory, such as facts and concrete materials, or intuitive, such as abstract materials and theories.[9,20] The visual-verbal dimension describes the sensory channel that is preferred for the presentation of information and may be either visual, including pictures and diagrams, or verbal, including spoken or written text.[9,20] The sequential-global dimension relates to the process that students use towards understanding and may be either sequential, describing linear incremental steps in the learning process, or global, describing large random steps in a holistic learning process.[9,20]

Many instruments have been developed and used to investigate students' learning styles.[22] However, the Felder-Soloman ILS questionnaire is a widely used instrument for assessing student learning style preferences.[7,21] This questionnaire is freely available, allows for assessment of four learning style dimensions and can be easily administered and interpreted.[7,21] The ILS questionnaire is a useful instrument for assessing student learning style preferences, with adequate reliability indices (test-retest correlation coefficients between 0.57 and 0.77, as well as Cronbach alpha values between 0.62 and 0.76).[7] The questionnaire is valid for assessing learning style preferences in medical students in a higher education setting[7,18,21] and in the SA context.[6] Participants were required to choose their preferred phrase from two possibilities for each of the 44 statements. Based on their responses, preferences for each learning style dimension were determined by summing the scores for the relevant statements pertaining to the different learning style dimensions, where preferences for the first and second poles received a score of +1 and -1, respectively.[20] The scores for each learning style dimension range from +11 to -11 and may be classified as either balanced (from +3 to -3), moderate (5 - 7) or strong (9 - 11).[20,22,23] Using this scoring system, three groups are possible for each learning style dimension.[18] For example, in the global-sequential dimension students would be grouped as either balanced learners, global learners (moderate or strong) or sequential learners (moderate or strong).

Before data collection, the online questionnaire was piloted on 7 students who were not included in the final study sample. Based on the pilot study, no modifications were needed for the study instruments or procedure. Data from only fully completed questionnaires were captured on Microsoft Excel (Microsoft Corp., USA) and analysed using SPSS version 27 (IBM Corp., USA). Data were analysed with descriptive statistics and are presented as means, standard deviations, frequency counts, percentages, ranges and medians. The Fisher's exact test was used to test the association between the preference for the different learning style dimensions and demographic characteristics (level of study and gender). A p-value of <0.05 was considered statistically significant.

Ethical approval

Data collection commenced after the study protocol was approved by the Humanities and Social Sciences Research Ethics Committee (ref. no. HSSREC/00002846/2021). The study adhered to the tenets of the Declaration of Helsinki and all participants provided informed consent prior to participating.

Results

Characteristics of the sample

A total of 159 students completed the anonymous questionnaires, resulting in a response rate of 66.3%. In terms of the level of study, 29 (18.2%) students were in their first year, 47 (29.6%) in their second year, 53 (33.3%) in their third year and 30 (18.9%) in their fourth year. Most of the students were black (n=111), followed by Indian (n=45), with a small proportion of coloured and white (n=3) students. The majority of students were female (n=123; 77.4%) and aged <21 years (n=83; 52.2%).

Felder-Soloman index of ILS questionnaire results

Table 1 shows the frequency of the different learning style preferences of optometry students, stratified for level of study. Overall, the majority of students were balanced in the active-reflective (n=103; 64.8%), visual-verbal (n=75; 47.2%) and sequential-global (n=91; 57.2%) dimensions. Nonetheless, there were higher frequencies for the reflective, visual and sequential groups than the active, verbal and global groups, respectively. For the sensing-intuitive dimension, the majority of students (n=83; 52.2%) showed a preference for the sensing group (Table 1). The global group was the least preferred, as frequencies <5 were noted for students in all levels of study (Table 1). There was no significant association between level of study and the four learning style dimensions (active-reflective, p=0.054; sensing-intuitive, p=0.714; visual-verbal, p=0.891; and sequential-global, p=0.156). Table 2 shows the frequency of the different learning style preferences for the two gender groups. When stratified for gender, male and female students showed the same trend of preferences for the active-reflective, sequential-global and sensing-intuitive dimensions, where the highest frequencies were noted in the balanced and sensing groups, respectively. For the visual-verbal dimension, the majority of female students preferred the balanced group, while most male students showed a preference for the visual group (Table 1). There was no significant association between gender and the active-reflective (p=0.447), sensing-intuitive (p=0.331) and sequential-global dimensions (p=0.432).

Discussion

This study describes the preferred learning styles of optometry students in an undergraduate programme. Such information is important for future curriculum evaluation and review endeavours aimed at improved alignment of the preferred learning styles of students to the teaching styles employed in the programme. This information is necessary to create an optimal educational environment that maximises student learning by considering their preferences.[13,14,24]

A learning style describes the preferred way in which information is acquired, processed, retained and applied.[9,10,22] Most of the optometry students had a balanced style for all the learning style dimensions, except the sensing-intuitive dimension. This implies that optometry students showed no distinct preference for the way in which information is processed, the sensory channel through which information is presented or the process used to understand the information. These findings are similar to those in studies involving optometry students who used the same questionnaire, and noted a higher proportion of students in the balanced group for these learning style dimensions.[8,18] Hosford and Siders[7] reported that medical students showed a balanced preference for the active-reflective and sequential-global dimensions. The findings in the current study suggest that student-teacher interactions and the associated materials and experiences that encompass active engagement via group work, reflection, pictures and diagrams, textual information, and linear or random steps would be well suited to the learning and development of most optometry students at UKZN. Consequently, using different teaching styles, materials and resources would not be an impediment for learning when students have a balanced preference, as

Table 1. Frequency of the different learning styles of optometry students (n=159) stratified for level of study

Learning style dimensions		Total, *n* (%) (*n*=159)	Level or year of study: First, *n* (%) (*n*=29)	Second, *n* (%) (*n*=47)	Third, *n* (%) (*n*=53)	Fourth, *n* (%) (*n*=30)
Active-reflective	Active*	23 (14.5)	0 (0.0)	9 (19.1)	9 (17.0)	5 (16.7)
	Balanced	103 (64.8)	19 (65.5)	27 (57.4)	35 (66.0)	22 (73.3)
	Reflective*	33 (20.8)	10 (34.5)	11 (23.4)	9 (17.0)	3 (10.0)
Sensing-intuitive	Sensing*	83 (52.2)	15 (51.7)	21 (44.7)	29 (54.7)	18 (60.0)
	Balanced	61 (38.4)	10 (34.5)	20 (42.6)	20 (37.7)	11 (36.7)
	Intuitive*	15 (9.4)	4 (13.8)	6 (12.8)	4 (7.5)	1 (3.3)
Visual-verbal	Visual*	67 (42.1)	13 (44.8)	18 (38.3)	21 (39.6)	15 (50.0)
	Balanced	75 (47.2)	14 (48.3)	22 (46.8)	27 (50.9)	12 (40.0)
	Verbal*	17 (10.7)	2 (6.9)	7 (14.9)	5 (9.4)	3 (10.0)
Sequential-global	Sequential*	58 (36.5)	10 (34.5)	11 (23.4)	21 (39.6)	16 (53.3)
	Balanced	91 (57.2)	17 (58.6)	32 (68.1)	28 (52.8)	14 (46.7)
	Global*	10 (6.3)	2 (6.9)	4 (8.5)	4 (7.5)	0 (0.0)

*Moderate or strong preference.

Table 2. Frequency of the different learning styles of optometry students (*n*=159) stratified for gender

Learning style dimensions		Total, *n* (%) (*n*=159)	Gender: Male, *n* (%) (*n*=36)	Female, *n* (%) (*n*=123)
Active-reflective	Active*	23 (14.5)	4 (11.1)	19 (15.4)
	Balanced	103 (64.8)	22 (61.1)	81 (65.9)
	Reflective*	33 (20.8)	10 (27.8)	23 (18.7)
Sensing-intuitive	Sensing*	83 (52.2)	21 (58.3)	62 (50.4)
	Balanced	61 (38.4)	14 (38.9)	47 (38.2)
	Intuitive*	15 (9.4)	1 (2.8)	14 (11.4)
Visual-verbal	Visual*	67 (42.1)	21 (58.3)	46 (37.4)
	Balanced	75 (47.2)	15 (41.7)	60 (48.4)
	Verbal*	17 (10.7)	0 (0.0)	17 (13.8)
Sequential-global	Sequential*	58 (36.5)	11 (30.6)	47 (38.2)
	Balanced	91 (57.2)	24 (66.7)	67 (54.5)
	Global*	10 (6.3)	1 (2.8)	9 (7.3)

*Moderate or strong preference.

they are able to easily adapt their approach to the needs of the learning experience and environment.[18]

Most students in this study showed a preference for the sensing group, which is different from other studies that noted no preference in the sensing-intuitive dimension.[13,18] Pancholi[8] noted that optometry students showed a strong preference for the sensing group. Students who have a preference for the sensing group tend to rely on observation and collect information using their senses;[25] they also prefer to learn with concrete information such as facts, data and scenarios.[9] Preference for the sensing group may be attributed to the preclinical and clinical elements in the optometry curriculum that emphasise clinical problem-solving skills that are needed for the examination of patients. The sensing preference aligns well to these elements, which rely on the process of assimilating information from patients and diagnostic testing procedures to formulate a diagnosis and management plan. This explanation seems plausible, as students who have a preference for the intuitive group tend to prefer abstract information such as theories, concepts and principles.[25] It has been observed that students in language programmes show a preference for the intuitive group,[25] which may be due to the nature of non-health-related disciplines v. health-related disciplines. Consequently, clinical case scenarios with either real or hypothetical patient data using problem-based learning should be used for student-teacher interactions in the health-related disciplines.

In this study, the global dimension was the least preferred by students (*n*=10; 6.3%). Other studies[6,8,18] have reported similar findings for optometry students. Prajapati *et al.*[18] reported that only 3% (*n*=8) of their sample of 270 optometry students had a preference for the global group. Pancholi[8] reported that only 3% (*n*=6) of their sample of 195 optometry students showed a preference for the global group. The global preference is characterised by a learning process that consists of large random steps towards understanding. Educational researchers have advised that students should be given specific opportunities and encouraged to develop less dominant learning styles.[9,12] It is therefore recommended that optometry teachers gradually encourage students to use a holistic 'big picture' learning process to allow for expansion of the global pole so that they can benefit from teaching methods that may not necessarily align with their preferred learning style.[9] Thus, teachers can present the learning goal, context and relevance of a particular clinical problem without presenting the steps for the problem-solving process. Thereafter, optometry students should be encouraged and supported to think

through the clinical problem and formulate steps towards possible solutions without being forced to conform to the steps that their teachers would use.[9] This is important for the personal growth of students and would be essential to their development as holistic learners.[12]

Optometry is a dynamic profession with unique responsibilities within a healthcare system. Optometry education programmes need to be responsive to the changing demands of its students and the communities that it serves. Similar to other health-related programmes, optometry programmes have also experienced a shift from traditional teacher-centred to student-centred educational environments.[24] This shift is possibly attributed to the well-recognised limitations of the traditional teacher-centred environments and passive role of students therein.[26] Student-centred educational environments are non-threatening, value collaboration and peer learning and require that students take on more active roles in the student-teacher interactions.[26-28] Student-centred environments emphasise teaching for understanding to enhance learning rather than covering the content in a curriculum.[26] A recent study showed that optometry students achieved better academic grades when teachers used student-centred approaches.[29] The structure and nature of the student-teacher interactions in these environments foster the development of communication, presentation, teamwork, problem solving, collaboration, global literacy and self-regulation skills.[26,29] This is important, as health-related undergraduate programmes need to adequately train students to meet the intended learning outcomes of the programme and develop lifelong learning skills needed to remain active professionals.[6,24] Self-regulation and lifelong learning skills would be critical, as optometrists undertake continuous professional development activities throughout their careers for professional and clinical development.

The COVID-19 pandemic further strengthened the imperative for undergraduate health-related programmes to equip students with the necessary knowledge, skills and attitudes to effectively fulfil their professional responsibilities in everyday practice.[24,30] Ramani and Hussaindeen[31] outlined strategies that optometry programmes should consider and use when continuing with academic activities, in spite of the regulations imposed by the COVID-19 pandemic. In light of the educational reforms that have been enforced by the COVID-19 pandemic, it is likely that blended learning with greater use of online methods of learning will remain in optometry programmes in the post-COVID-19 era.[30] Therefore, it is critical that the optometry curricula be reviewed and transformed to be contextually relevant while still meeting the needs of its students, communities and society. Such endeavours will ensure that the optometry curriculum is better suited to the current student populations that consist of iGeneration learners accustomed to using technology for educational, social or recreational purposes.[17]

Study strengths and limitations

Strengths of this study include the use of a questionnaire that is a valid measure of learning style preferences and has been used in previous studies.[6,18,27,28] However, the results are specific to optometry students at a particular higher education institution and may not be generalised to other students. Future studies should include students in the other SA institutions that offer optometry programmes. This information may be useful to the educational sub-committees of the professional and regulatory bodies that govern optometry education in SA to better inform decisions related to teaching and learning. Lastly, it should be noted that learning style preferences only suggest behavioural tendencies and therefore may not be a comprehensive indictor of student behaviour during learning activities.[18,23]

Conclusion

This study presented insight into the learning style preferences of optometry students in an undergraduate programme. The findings suggest that most optometry students have balanced learning style preferences. Data from this study may be useful to optometry curriculum planners, as knowledge of learning style preferences may help to improve the structure and implementation of the curriculum. These results can serve as the impetus for stakeholders responsible for optometry education within the SA context to think about and better inform curriculum review endeavours and decisions related to teaching and learning to enhance student-teacher interactions.

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