

## Learning styles of first year occupational therapy students studying at a university in South Africa

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### ABSTRACT

**Introduction:** Occupational therapists by the very nature of their scope of practice have to apply an evolving broad spectrum of knowledge and skills to be able to fulfil their various roles as therapists. In order to understand how occupational therapy students learn, learning style studies have been conducted in various countries. Due to differing terminology used by the various measurement instruments, it is difficult to compare findings to allow for generalisation of the results. The aim of this study was to identify the learning style profiles of first year occupational therapy students at a university in South Africa. These profiles are used to broaden their self-knowledge in order to become socially and professionally well-adjusted therapists that take responsibility for their own continual learning.

**Method:** A descriptive study to determine a learning style profile by means of the instrument known as the Felder-Soloman Index of Learning Styles was undertaken. A convenience sample of 114 first year occupational therapy students between 2009 and 2011 was used.

**Findings:** Results indicated sensing, visual, active and sequential learning styles as the most representative learning styles. The active learning style being the most dominant.

**Conclusion:** Occupational therapy students should be encouraged and assisted to determine their own learning styles. Understanding their own learning style profiles may equip students better to fulfil the need to become lifelong learners. Further studies may identify possible changes to this learning style profile due to the changing demographics of occupational therapy students.

**Key words:** Learning styles, occupational therapy students, teaching and learning

## INTRODUCTION

Enabling occupational therapy students to both meet the educational requirements of their undergraduate degree and continue to meet the professional requirements of being lifelong learners is important, yet remains a challenge. Occupational therapists by the very nature of their scope of practice have to apply an evolving broad spectrum of knowledge and skills to be able to fulfil their various roles as therapists<sup>1</sup>. It is thus important to provide occupational therapy students with opportunities to broaden their self-knowledge in order to become socially and professionally well-adjusted therapists that take responsibility for their own continual learning. One method that may be employed to increase self-knowledge is to provide them with an opportunity to understand their own learning styles<sup>2</sup>.

Learning and more specifically how people learn has been questioned and studied since the early 20<sup>th</sup> century<sup>3</sup>. It has been theorised that the factors shaping learning styles are varied and may be influenced by the socialisation process, educational background, language, existing skills and learning preferences<sup>4,5</sup>. A definition given by Dunn<sup>5,88</sup> stating that "Learning styles are a biologically and developmentally imposed set of personal characteristics that make the same teaching method effective for some and ineffective for others", appears to capture the conclusions reached by many of these researchers<sup>3,5</sup>.

Understanding their own learning style preferences could provide occupational therapy students with an understanding of how they may maximise their own learning and how to adapt to teaching

methods that are not dominant in their existing learning style profile. This understanding of their own learning style preferences may lead to an increased ability to integrate information, resulting in cognitive maturity and the stimulation of a deep approach to learning<sup>6</sup>. Not only will it benefit the occupational therapy students to have insight into their learning style preferences, but their educators would also gain insight into the teaching methods preferred by their students. This insight could enable the educator to accommodate the learning style requirements of all their students in their teaching methods. In South Africa as in many other countries, students go through a selection process for admission to the study of occupational therapy. Insight into the learning style profile of occupational therapists may assist in the selection of these students.

The use of learning styles for optimising the interaction of occupational therapy students with information, has been investigated internationally by various researchers<sup>6,7,8,9</sup>. Even though a degree of overlapping of the learning requirements or styles of occupational therapy students was evident in some of the international studies, there is insufficient information to assume that a similar learning style profile exists for occupational therapy students worldwide. As a profession it therefore appears that there is a lack of a universal learning style profile for occupational therapy students.

In order to determine if the first year occupational therapy students at a university in South Africa have a similar learning style profile a study was conducted from 2009 to 2011. The aim of this study was to explore the learning style preferences of these first-year occupational therapy students and to provide these students with a deeper



insight into their own learning style profiles. This paper reports on the finding of the study and makes a number of recommendations.

## LITERATURE REVIEW

During the early 20<sup>th</sup> century, Jung<sup>3</sup> began asking questions about the effect of the environment combined with cognitive abilities on learning, and learning requirements of students. These questions were expanded on and resulted in a large number of instruments for the assessment of learning styles being developed over the years. Litzinger *et al*<sup>10</sup>, for example, reported that 71 learning style instruments aimed at the post-16 age group, could be identified in 2007.

The purpose and how learning styles are categorised for each of these learning style instruments appear to differ according to the point of view held by the developer of each instrument. For example, the Myers-Briggs Type Indicator<sup>11</sup>, is based on the theories of Jung, and indicates how individuals process information linked to their personality. Others, like Kolb<sup>12</sup>, focus on how information is processed. Dunn<sup>5</sup>, in turn, focuses on the perceptual aspects of learning. No common framework appears to have been used in the formulation of these learning style instruments. In addition, many learning style instruments cover similar ground without using common terminology. This lack of common terminology results in confusion for those who set out to identify and compare the learning styles of specific groups or individuals, it also makes it difficult to compare the outcomes of research.

Another confounding factor is that there are two opposing commonly held views about learning styles. The first is that learning styles are fixed, i.e. learning styles remain the same throughout life. This in turn leads to the understanding that education should be adapted to adhere to the identified learning style(s) in order for successful learning to be achieved. The opposing view is that learning styles change or broaden over time according to the content and demands of the information being received<sup>13</sup>. According to this view, the students should be encouraged to become more sensitive to understanding and broadening their learning style preferences, and to potentially adopt or assimilate other learning style preferences that are fit-for-the-purpose at the time<sup>14</sup>. In support of this opinion, research undertaken by Katz and Heimann<sup>7</sup>, reported that there was a shift in the learning style profiles of first-year occupational therapy students as compared to therapists who had more than two years of work experience<sup>7</sup>. In the same study similar shifts in learning styles were also noted amongst physical therapists, nurses, social workers and clinical psychologists<sup>7</sup>. The results of this study by Katz and Heimann<sup>7</sup> seem to confirm the notion that learning styles do in fact change over time.

Several studies have been conducted on the learning styles of occupational therapy students<sup>6-9</sup>, but the use of different measurement instruments complicates the comparison of findings. However, similarities in the key-words used in some of the measurement instruments, make it possible to deduct possible commonalities between the findings in order to draw comparisons. The Kolb Learning Style Indicator instrument was used in two of these studies undertaken with occupational therapy students in United States of America and Israel<sup>6,7</sup>. Both these studies identified abstract-conceptualisation, (indicating logical analytical thinking) and active-experimentation (indicating active learning or doing) as the preferred learning styles of occupational therapy students. A study conducted in Australia with occupational therapy students combined the Kolb Learning Style Indicator instrument with the Visual-Aural-Writing-Kinaesthetic (VARK) instrument in order to add information on the teaching method of the students<sup>8</sup>. The findings of the Kolb instrument once again indicated abstract-conceptualisation and active experimentation as the dominant learning style preference for their occupational therapy students. A different study conducted on occupational therapy students in Israel by Katz<sup>9</sup> used the Felder-Soloman Index of Learning Style as their measurement instrument<sup>9</sup>. The most dominant learning style identified in this study was the 'global' learning style, indicating abstract analytical thinking<sup>9</sup>. Due

to the lack of uniform terminology as discussed earlier, it is difficult to compare or extrapolate the results of these four studies in any meaningful coherent way. The use of different measurement instruments does not, therefore, provide a satisfactory conclusion about the learning styles of occupational therapy students globally.

### The measurement instrument used for this study

The Felder-Soloman Index of Learning Styles instrument was used to determine the learning styles of first year occupational therapy students at a university in South Africa. Felder and Silverman developed the original Index of Learning Styles instrument in 1988<sup>14</sup>. The Felder and Silverman Index of Learning Styles instrument was originally developed to determine the learning styles and teaching requirements of engineering students. This instrument consisted of five domains with a corresponding teaching style for each<sup>14</sup>.

The five domains as described by Felder and Silverman were the following:

- ❖ **Perception:** focus on sensory-intuitive learning with teaching methods consisting of concrete or intuitive and abstract teaching.
- ❖ **Presentation:** focus on the visual-verbal-means of learning with teaching methods consisting of verbal or visual teaching methods.
- ❖ **Organisation:** focus on inductive-deductive learning with teaching methods consisting of inductive or deductive teaching methods.
- ❖ **Processing:** focus on active-reflective learning with the teaching methods consisting of active or passive participation in the teaching methods.
- ❖ **Understanding:** focus on sequential-global learning with the teaching method consisting of sequential or global teaching methods<sup>14</sup>.

In 1995, the original Felder-Silverman instrument underwent adaptation by Felder<sup>15</sup>. Although the article was written by Felder, the adaptations were made by both. It was decided to remove the organisation domain from the instrument<sup>15</sup>. The Felder-Soloman Index of Learning Styles instrument thus now consists of only four domains, with eleven dichotomous questions allocated to each domain<sup>16,17</sup>. The eight learning preferences representing the four domains are:

- ❖ **Sensing-Intuitive (Perception):** The sensing learner learns through more concrete hands-on experience like sight, sounds and other physical sensations while the intuitive learner is more comfortable with theories and models based on thoughts, memories and insights.
- ❖ **Visual-Verbal (Presentation):** The visual learner prefers to interact with information through pictures, diagrams, demonstrations, animations and other visual stimuli while the verbal learner prefers the written or spoken word. Cognitive scientists have established that the brain converts the spoken and the written words into the verbal equivalent, thus spoken and written words are included in the same category.
- ❖ **Active-Reflective (Processing):** The active learner processes information through physical engagement or discussion while the reflective student processes information through introspection.
- ❖ **Sequential-Global (Understanding):** The sequential learner prefers the progression of understanding to be a logical linear process, and functions well with partial understanding. The global learner wants to have the "big picture" to be able to think in a system-orientated manner and in order to achieve full understanding. All the information must therefore be available and understood, resulting in a holistic perspective<sup>16,18</sup>.

Each domain consists of two opposing learning preferences but one is usually more dominant. The more dominant learning preference for each domain is determined by adding the scores representing each learning preference. The extent of the difference between the two preferences may vary, indicating the degree of dominance



of the one learning preference in comparison to the other.

Kolb<sup>12</sup> as well as Felder and<sup>19</sup> emphasise that learning styles identified by the learning style instruments only suggest behavioural tendencies and should be regarded as a continuum and not as a separate either/or learning style preference. Each learning domain represents a different characteristic of learning; e.g. cognitive, psychological, and behavioural. For identification of the learning style profile of a student, each of the four domains should be determined<sup>20</sup>.

Various studies to determine the reliability and validity of the Felder-Soloman Index of Learning Styles instrument have been conducted internationally. Litzinger *et al*<sup>21</sup> conducted a study that found reliability of  $p=0.05$  and one even as low as  $p=0.01$  for the Felder-Soloman Index of Learning Styles instrument. The reported coefficients for reliability are active-reflective 0.61, sensing-intuitive 0.77, and visual-verbal 0.76 with the sequential-global scale weaker at 0.55, with the minimum requirement for being reliable being  $r>0.05$  which would indicate a significant lack of reliability. The construct validity of the instrument reported is more than 90% for active-reflective, sensing-intuitive and visual-verbal. Sequential-global is weaker but still above 80%<sup>21</sup>. Litzinger *et al*<sup>21</sup> cited the results published by Liversay *et al*. and Zwanenberg *et al* and compared these with the results of their own study and reported similar results with only marginal differences confirming the reliability and validity<sup>21</sup>. Another study conducted by Cook<sup>22</sup> on the reliability of the Felder-Soloman Index of Learning Styles instrument for medical education reported coefficients for reliability as: - active-reflective 0.61, sensing-intuitive 0.78, and visual-verbal 0.70 with the sequential-global scale weaker at 0.67 with the minimum requirement being  $p<0.05$  to indicate a significant lack of reliability<sup>22</sup>. The test results of Litzinger *et al*<sup>21</sup> and Cook<sup>22</sup> are reflected in Table 1.

**Table I: A comparison between the reliability coefficients as reported by Litzinger *et al*<sup>21</sup> and Cook<sup>22</sup>**

Source	Sensing-Intuitive	Visual-Verbal	Active-Reflective	Sequential-Global
Litzinger <i>et al</i> <sup>21</sup>	0.77	0.76	0.61	0.55
Cook <sup>18</sup>	0.78	0.70	0.61	0.67

## METHODOLOGY

### Design

A descriptive study with the use of a sample of convenience was used, while employing the Felder-Soloman Index of Learning Styles instrument<sup>23</sup> as measurement tool. The sample consisted of all the first-year occupational therapy students studying at a university in South Africa between 2009 and 2011.

### Study population

The first year occupational therapy students from 2009 to 2011 ( $n=114$ ) were invited to participate in the study. Information regarding the purpose of the study was provided in an information leaflet. Informed consent forms were provided for signature as well as a basic demographic questionnaire. Voluntary participation was emphasised and consent forms signed. Confidentiality was assured by allocating students with numbers from a predetermined range. All data were collected according to these numbers in order to maintain the anonymity of the participants. The Felder-Soloman Index of Learning Styles instrument is available on the internet with permission for individuals and researchers to use the instrument without cost. The Felder-Soloman Index of Learning Styles instrument was transcribed to the Umfundi programme that is used to enter information on the intranet before manual submission to the internet by the researcher. This method enabled the researcher to have access to the raw data to simplify statistical analyses.

Ethical clearance was obtained for the study from the Ethics Committee of the Faculty of Health Sciences at the University of Pretoria.

### Data analysis

Questions in the Index of Felder-Soloman Learning Styles instrument are answered in a dichotomous manner, with a choice between two statements<sup>24</sup>. The binary nominal data was calculated according to the number of replies allocated to each learning preference. Data were analysed to identify the dominant learning preference in each of the four learning domains for each participant as per the Felder and Soloman adaptation<sup>15</sup>. Descriptive analysis was carried out with the use of the following analytical processes: - Analysis of variance, Cronbach's alpha, and the non-parametric Mann-Whitney test.

To confirm the reliability of the Felder-Soloman Index of Learning Styles for the South African context a reliability study was conducted on the 2009 group of students. To determine the internal consistency of each scale the Cronbach's alpha was calculated for each year group after which the non-parametric Mann-Whitney test was conducted to compare the alpha coefficients of the 2010 and 2011 year groups to determine any significant variations between these two year groups. An analysis of variance was used to provide a simple frequency distribution table reflecting the number of responses representing each learning preference according to the four domains. The frequency values for each scale were determined for each year group after which the data of the three year groups were combined to reflect the total sample group. The statistical tool used for analyses was the STATA 11.

## RESULTS

### Population demographics

The demographics of the participants in the study are reflected in Table II. Gender: female 99.2%, male 0.8%. Home Language: English 31.5%, Afrikaans 63.1%, and other languages 5.7%. Cultural differences: White South African 95.8% and other SA cultural groups 4.2%.

### Learning styles of population / students

According to the frequency distribution of the learning style preferences the dominant preferences of the participants were sensing, visual, active and sequential. These results indicate that a

**Table II: The demographic distribution of the participants to the study**

		2009	%	2010	%	2011	%	Total%
<b>Gender:</b>	<b>Male</b>					01	02.3	00.8
	<b>Female</b>	33	100	39	100	41	97.6	99.2
<b>Language</b>	<b>Afrikaans</b>	20	60.7	26	66.7	26	61.9	63.1
	<b>English</b>	13	39.3	10	25.6	13	29.5	31.5
	<b>Other</b>			03	7.7	04	09.5	05.7
<b>Culture</b>	<b>White</b>	32	96.9	38	97.4	39	92.8	95.8
	<b>Other</b>	01	03.1	01	2.5	03	07.1	04.2

**Table III: The distribution of learning styles of first year occupational therapy students at the University of Pretoria N=114 (2009 - 2011)**

Learning style	N	%	Learning style	N	%	Total N
sensing	83	72.8%	intuitive	31	27.2%	114
visual	96	84.2%	verbal	18	15.8%	114
active	71	62.2%	reflective	43	37.8%	114
sequential	81	70.0%	global	33	29.0%	114



large percentage of the sample group falls within this learning style profile. The intuitive, verbal, reflective and global learning style preferences are represented by a smaller percentage of the sample group. It must be remembered that the learning style preferences vary according to each individual in the sample group, there are many different combinations of learning style preferences that are beyond the scope of this study to analyse in detail. The results of the identified learning preferences of the study group over the three year-groups (N=114) are reflected in *Table III* (page 25).

### Reliability of the Questionnaire

The alpha coefficients for the 2009 sample group (n=33) in terms of reliability were determined for this study. Each of the four domains are reflected in *Table IV* indicating similar reliability for all the learning style domains as reported by Litzinger et al<sup>24</sup>. These results indicated that the Felder-Soloman Index of Learning Styles instrument is suitable for the South African population. Results of the non-parametric Mann-Whitney test indicated no significant difference between the results of the 2010 and 2011 groups. Results found were: active-reflective 0.52, sequential-global 0.09, sensing-intuitive 0.43 and visual-verbal 0.89 with a requirement set at  $p < 0.05$ .

**Table IV: Coefficients for each learning style scale for 2009 - 2011 with the minimum standard  $r < 0.05$  compared to the values as published by Litzinger et al<sup>21</sup>**

Year group	Sensing-Intuitive	Visual-Verbal	Active-Reflective	Sequential-Global
Litzinger et al <sup>21</sup>	0.77	0.76	0.61	0.55
2009	0.71	0.50	0.62	0.77
2010	0.75	0.68	0.60	0.47
2011	0.76	0.70	0.61	0.49

**Table V: Comparison of the variation between 2010 and 2011 learning style domains**

Learning style domain	Probability score
Sensing / Intuitive	$p=0.43$
Active/ Reflective	$p=0.52$
Visual / Verbal	$p=0.90$
Sequential / Global	$p=0.10$

## DISCUSSION

The Felder-Soloman Index of Learning Style instrument identified the most dominant learning style preferences for the sample group as sensing-visual-active-sequential. The intuitive-verbal-reflective-global learning style preferences were represented to a less dominant degree. The visual learning preference was the most frequently represented in the sample group.

After completing the Felder-Soloman Index of Learning Styles, feedback of the results were given to the individual participants. Feedback consisted of an information leaflet explaining the implications of their own results and suggestions on how other learning style preferences may be cultivated. This information leaflet is provided as a part of the electronic interpretation of the Felder-Soloman Index of Learning Style instrument<sup>23</sup>. The benefit to participants in the identification of their learning styles lies in providing self-knowledge. An understanding of their own learning requirements may lead to an increase in their ability to integrate information, resulting in cognitive maturity and stimulation of a deep approach to learning. Cognitive maturity and a deep approach to learning will assist the occupational therapy student to master the broad spectrum of knowledge and skills required to fulfil their various roles as occupational therapists and result in the development of lifelong learners.

Insight gained by educators from the learning preferences of the students may direct their teaching methods used in educating these occupational therapy students. The results indicate that teaching should follow a logical order (sequential) building knowledge from basic to more complex, concrete (sensing) examples should be used in a visual active manner to establish a good basis for ground level knowledge. The existing sensing-visual-active-sequential learning style requirements may thus be employed but according to Felder it is possible to stimulate the development of the less dominant learning style by employing diverse sources of information like articles, class notes, discussions and textbooks to stimulate expansion of especially the global, intuitive and reflective learning styles<sup>14</sup>. It is thus essential to develop the less dominant learning preferences to provide the students with an opportunity to expand on their own learning preference. Gradual expansion to providing the bigger picture (global) allowing the student to reflect, search for information (verbal), and integrating (intuitive) different sources of information should thus be introduced in the teaching methods used.

Due to the lack of common terminology it is difficult to compare the learning preferences identified by this research with the findings of other studies. Some similarity to the learning preferences of occupational therapy students in other countries may be deduced, especially the results of the studies conducted with the use of the Kolb Learning Style Index instrument<sup>6-8</sup>. The combination of the Kolb Learning Style Index instrument and the VARK<sup>7</sup> tests identified the active (active-experimentation) and sequential (abstract-conceptualisation) learning preference. However, the study carried out by Katz<sup>9</sup> in Israel by means of the Felder and Soloman Index of Learning Styles measurement instrument identified the most dominant learning styles as; intuitive-verbal-reflective-global, of which the global learning preference is the most frequently represented<sup>9</sup>. The results of this Israeli study are directly opposite to the findings of this study. It is not possible to explain the difference in the findings between the Israeli and South African studies, both of which used the Felder-Soloman Index of Learning Styles instrument, without more in-depth information on the criteria as well as the geographic information of the participants e.g schooling, race and teaching methods for the Israeli study<sup>9</sup>.

Since the learning style profiles identified in the research for each of the three year-groups are similar, it could be concluded that the identified learning style profile is representative of the present population of first-year occupational therapy students at one university in South Africa. It is, however, not possible to generalise the findings of this research in terms of a bigger population because the demographic distribution at the different universities in South Africa may vary. The gradual increase in especially Black, Coloured and Asian students being interested in and qualifying for selection to study occupational therapy may result in a change in the learning style profile due to different cultural and schooling backgrounds.

## RECOMMENDATIONS

A longitudinal study on learning style profiles that explores cultural/gender/schooling differences may assist lecturers in educating students from different backgrounds. It is recommended therefore that learning style preferences of the first year occupational therapy students continue to be determined so that possible changes may be identified in each new group. The information will enable educators to be informed about changes in the teaching and learning requirements of the students so that they might stay in step with appropriate teaching and learning methods. More importantly self-knowledge might lead occupational therapists to become life-long learners, a pre-requisite to remain on the cutting-edge of their chosen profession.

Repeating the Felder-Soloman Index of Learning Styles instrument test at the end of the four-year course, or after the student has qualified and started working as a therapist, might determine possible changes in the learning style profiles of the individuals. The results of such retesting may provide insight into the effect



of personal growth and the development of different learning methods.

## CONCLUSION

The learning style preferences representative of the first-year occupational therapy students studying at a university in South Africa were found to be sensing-visual-active-sequential. In order to facilitate more effective interaction with information, occupational therapy students should have an understanding of their own learning styles. Occupational therapy students should thus be encouraged and assisted to determine their learning styles at the beginning of their first year of study. Determining the representative learning styles on a regular basis will identify possible changes in the teaching and learning requirements of the occupational therapy students. This will indicate to educators possible changes needed in the teaching methods that will satisfy the learning style requirements of the majority, as well as areas that need stimulation in order to extend the personal growth of the students to benefit from teaching and learning methods other than their own preferred requirements.

Further studies determining learning style profiles on different racial groups, language groups, and even rural and urban groups may provide valuable information on possible changes in the learning style profile of occupational therapy students. To establish a learning style profile for South African occupational therapy students, more extensive studies at different universities will need to be conducted with the same measurement instrument.

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