

# Comparison of Learning Styles of British and Yemeni Students

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## INTRODUCTION

The Institute for Manufacturing at the University of Cambridge teaches postgraduate students from a wide range of countries predominantly using problem based learning methods. The methods include short term industrial assignments and classroom activities that require a high level of engagement and active participation. While there are many benefits to this system there was also a concern that the methods might disadvantage students whose undergraduate education was in countries where the teaching and learning were based on more traditional lecture based techniques. To investigate this a study was carried out to compare the preferred learning styles and culture of British and Yemeni engineering students.

## 1 LITERATURE REVIEW

### 1.1 Learning Styles

Since its inception, the field of learning styles has grown significantly with various definitions and models that have left teachers and instructors “overwhelmed by this vast body of literature” (De Vita, 2001)[1]. To add to the confusion, in recent times, the term ‘learning styles’ has been used interchangeably to refer to other concepts related to the field of education.

According to several reviews of the learning styles field (Zhang et al (2011) [2]; Felder & Brent, 2005 [3]) there are a number of learning style models available:

Fleming's VARK model, Kolb's Learning Style Inventory, Felder & Silverman's Index of Learning Styles, and Dunn & Dunn's Learning Style Model (LSM).

The Felder-Silverman model (1988) [4] was initially targeted at engineering students, though it has since been implemented in the social sciences (De Vita, 2001)[1]. Felder define learning styles as “the characteristic strengths and preferences in the ways individuals take in and process information”. The model defines four dimensions:

1. Perceiving information - with the preferences varying between **sensing** learners who prefer data, facts, experiments etc and **Intuitive** learners who prefer unconscious/subconscious gathering of facts.
2. Receiving information – **visual** learners who have a preferences for graphics etc and **verbal** learners who prefer to be told things
3. Processing information – **active** learners who prefer to process information by implementing it in the external world and **reflective** learners who prefer to examine it introspectively
4. Understanding information – **sequential** learners who prefer to master material in steps from the bottom up and **global** learners who prefer to understand the ‘big picture’ first.

The learning styles field is not without criticism (De Vita, 2001[1]; Evans et al, 2009[5]). This criticism however appears somewhat unjustified, since most learning style supporters clearly warn against “misuse”. Felder & Spurlin, 2004 [6] warned that “learning style preferences are not reliable indicators of learning strengths and weaknesses”, and that they should never be used for discriminatory student classification.

## 1.2 Learning Styles and Culture

The potential link between culture and learning styles was first suggested by Kolb & Fry (1975) [7], who argued that important agents of socialization, such as family, school and work, will influence the development of an individual's learning styles. They surveyed 100 students and found that students with different learning styles reacted differently to certain teaching elements. Similar work aligning cultural and learning styles has been reported by others such as Barmeyer (2004) [8].

Having identified suitable conceptualisations of learning style the next challenge is to select a model of culture; well recognised models include - The Hofstede Model (Hofstede (2010),P6) [9] – The Trompenaars Model, the Schwarz Model and the GLOBE Model. The original Hofstede model has a four dimension framework (similar to the Felder model) where the dimensions are defined as:

1. Power Distance (PDI) – the degree to which less powerful members of society accept and expect unequal distribution of power, e.g. the acceptance of hierarchy
2. Individualism (IDV) – The degree of concern for the group as opposed to the individual.
3. Masculinity (MAS) – The degree of ‘traditional’ masculine traits of assertiveness, competitiveness etc.
4. Uncertainty Avoidance (UAI) – The level of comfort with ambiguity and uncertainty.

Subsequently two other dimensions of long term orientation and indulgence have been added.

Zualkernan, Allert and Qadah (2006)[10] conducted a study, using the Felder-Silverman ILS to compare the learning styles of Middle Eastern and American computer programming students. The study found that the learning style profiles of Middle Eastern and American students "mirrored one another in almost all respects", despite the two groups' "vast cultural differences". Kolb & Joy (2008)[11] have explained that this may be due to the effect of degree specialization on learning styles, arguing that specialization may have a stronger effect on learning styles than nationality. Zualkernan, Allert & Qadah's (2006)[10] study appears to be the only notable study investigating the learning styles of Middle Eastern students.

## 2 RESEARCH AIM AND OBJECTIVES

The study made two principal assumptions; firstly it will consider cultures to be defined by national boundaries and secondly to specifically focus on the learning styles of engineering students as the sample population.

### 2.1 Selecting the Host Countries

The study has selected the UK and Yemen to be the host countries. Since the study aims to focus on the Middle East, one of the host countries must be from that region. Yemen was deemed ideal for the study since one of the authors has cultural and ethnic roots from the country. Furthermore compared to other Middle Eastern nations, Yemen demonstrates the largest 'cultural gap' in relation to the 'Western' world (Abdulrab, 2011) [12], The UK has some of the best engineering academic institutes in the world, attracting a wide variety of ambitious international students. It would therefore be of great interest and value to compare British learning styles against those of other nations.

### 2.2 Research Questions

Having specified the geographic scope of the project, it was possible to formulate three questions:

1. How do the learning styles of British and Yemeni students compare against each other?
2. How do the learning style of British and Yemeni students compare against those of other nation states?
3. Can a relationship between cultures and specific learning styles be demonstrated?

### 2.3 Methodology

The Felder-Soloman (1991) [13] instrument was selected as a reference framework. Among its advantages were: Arabic language translation, theoretical suitability, acceptable validity and reliability, free and easy to implement.

To select the UK sample, a total of 20 UK Engineering Departments were contacted by email. The Universities were selected based on their national ranking (Times Higher Education Guide, 2011) and on the availability of email addresses for each department. Out of the 20 departments, 11 responded with interest, however only two agreed to carry out the survey in the timeframe required. This resulted in a sample size of 62 students, who filled in an on-line survey identifying their learning preferences.

In the Yemen, the city of Taiz is considered the educational hub of the country with a total of 8 universities considered to be well established, these were contacted by phone. Out of the 8, 3 agreed to carry out the survey in the required timeframe. This resulted in a sample size of 65; because of limited internet access in the Yemin the respondents were asked to fill in paper surveys.

To address question 2 a comparison of learning styles through an archival analysis of past data was carried out. As it was decided that the Felder-Soloman (1991) [13] questionnaire was to be used for questions 1, the archival analysis sought past studies that have used the model on engineering students in other nation states.

For question 3 it was decided that this question was to be addressed using archival analysis of past learning styles data combined with cultural dimensions. The Hofstede cultural model was selected as the most suitable to define those dimensions.

### 3 RESULTS

#### 3.1 Learning Style Survey UK and Yemen

The respondents were asked to rate themselves on a +11 to -11 point scale with the following results shown in table 1:

*Table 1: UK and Yemen Mean Learning Style Scores*

Learning Style	UK		Yemen	
	Mean	SD	Mean	SD
Active (-ve) v. Reflective (+ve)	-2.02	4.24	-0.69	3.11
Sensing (-ve)/ v. Intuitive (+ve)	-1.67	5.2	-2.17	4.91
Visual (-ve) v. Verbal (+ve)	-4.13	4.49	-5.22	4.32
Sequential (-ve) v. Global (+ve)	-2.39	3.86	-0.14	3.81

UK students appear to possess weak preferences for Active, Sensing and Sequential styles and a moderate preference for visual learning. The standard deviations are all relatively large, representing a variation from the mean of between 17-24% of the total 22-point scale (-11 to +11). Yemeni students have very weak preferences for the Active and Sequential styles. They have a moderate preference for visual learning, which is the strongest preference they hold amongst the four dimensions. As in the previous case, the standard deviations are significant, representing a variation from the mean of between 14 and 22% of the 22-point scale.

#### 3.2 Comparison with Archival Studies

The popularity of the Felder learning styles approach has resulted in a number of single country studies which could be identified from the literature (table 2) and their results combined in a meta-study.

*Table 2: Studies Identified from Archival Analysis*

Study Author and Date	Country	Sample Discipline	Sample Size
Zualkernan, Allert and Qadah (2006)	USA	Computer Engineering	61
Win et al (2006)	Malaysia	Civil and Mechanic Engineering	70

Zwyno (2003)	Canada	Elec. and Computer Engineering	338
Ultanir et al (2012)	Turkey	Engineering	301
Alfonseca et al (2006)	Spain	Computer Engineering	166
Leiba & Nachmias (2006)	Israel	Bio-Medical Engineering	58
Byrne (2007)	Ireland	Chemical Engineering	38

These results can be compared against the Felder dimensions in Table 3.

Table 3: Comparison of Archival Studies

Active (-ve)/ Reflective		Sensing (-ve)/Intuitive		Visual (-ve)/ Verbal		Sequential (-ve)/ Global	
UK	<b>-2.0</b>	Spain	-3.3	Israel	-6.1	Turkey	-4.5
Turkey	-1.9	Israel	-2.6	Malaysia	-5.5	UK	-2.4
Israel	-1.7	Turkey	-2.5	USA	-5.2	Ireland	-2.1
Spain	-1.5	<b>Yemen</b>	<b>-2.2</b>	<b>Yemen</b>	-5.2	Spain	-1.8
Canada	-1.0	Ireland	-1.9	Canada	-5.1	USA	-1.5
<b>Yemen</b>	<b>-0.7</b>	Canada	-1.9	Spain	-5.0	Canada	-0.9
Malaysia	-0.5	<b>UK</b>	<b>-1.7</b>	Ireland	-5.0	Israel	-0.8
USA	-0.3	Malaysia	-1.5	<b>UK</b>	-4.1	Malaysia	-0.7
Ireland	0.4	USA	-0.5	Turkey	-0.3	<b>Yemen</b>	-0.1

### 3.3 Comparing Learning Styles and Cultures

To investigate the relationship between learning style and culture each of the four original Hofstede cultural dimension (available from the Hofstede Centre website <http://geert-hofstede.com/countries.html>) were compared with each of the four learning style dimensions, resulting in a total of 16 possible relationships, see table 4. The criteria for claiming a valid relationship is a Pearson coefficient (*r*) of 0.5 or more and a (*p*) value of 0.05 or less. A negative value implies a positive correlation between the other two poles of the dimension.

Table 4: Hofstede Dimensions vs. Felder Learning Style Matrix – Pearson Coefficients (*r*) and *p* values

	Power Distance (PDI)	Individualism (IDV)	Masculinity (MAS)	Uncertainty Avoidance (UAI)
Active	<i>r</i> = -0.13 <i>p</i> = 0.80	<i>r</i> = 0.204 <i>p</i> = 0.85	<b><i>r</i> = -0.92</b> <b><i>p</i> = 0.0012</b>	<i>r</i> = 0.25 <i>p</i> = 0.70
Sensing	<i>r</i> = -0.0060 <i>p</i> = 0.99	<i>r</i> = -0.62 <i>p</i> = 0.010	<b><i>r</i> = -0.78</b> <b><i>p</i> = 0.024</b>	<b><i>r</i> = 0.74</b> <b><i>p</i> = 0.036</b>
Visual	<i>r</i> = -0.10 <i>p</i> = 0.80	<i>r</i> = -0.15 <i>p</i> = 0.70	<i>r</i> = -0.57 <i>p</i> = 0.14	<i>r</i> = -0.059 <i>p</i> = 0.88
Sequential	<i>r</i> = -0.63 <i>p</i> = 0.094	<b><i>r</i> = 0.722</b> <b><i>p</i> = 0.043</b>	<i>r</i> = 0.62 <i>p</i> = 0.11	<i>r</i> = -0.602 <i>p</i> = 0.11

## 4 DISCUSSION

### 4.1 Learning Styles UK & Yemen

The results showed that Middle Eastern students demonstrate significant differences in their learning styles compared with British students in two of the four dimensions. British students were found to be significantly more Active and Sequential than their Yemeni counterparts. The significant differences appear to occur in the 'processing' (Active-Reflective) and 'understanding' (Sequential-Global) dimensions, and not in the 'perceiving' (Sensing-Intuitive) and 'receiving' (visual-verbal) dimensions. This could be explained by considering the fundamental medium of knowledge transfer utilised in both countries. All of the universities involved in the study appeared to rely heavily on PowerPoint presentations for instruction delivered visually through technological media. This may explain why both countries prefer Sensing and Visual learning, and do not demonstrate significant differences in their level of preference.

### 4.2 Comparison of Learning Styles with Archival Studies

**Active-Reflective** - All the countries, with the exception of Ireland, demonstrate a weak preference for the Active learning styles. The reason for Irelands' uncharacteristic score may be the small sample size (38) used in the study, resulting in skewed results

**Sensing-Intuitive** - In the Sensing-Intuitive dimension, all nations appear to have a weak preference for the Sensing style. The average score for all nations is -2.

**Visual-Verbal** - All nations demonstrate a strong preference for visual learning, with the exception of Turkey, which demonstrates a very weak preference for the verbal style. The average mean score of all nations is -4.61, further supporting the notion that engineering students have a relatively strong preference for visual learning

**Sequential-Global** - All nations demonstrate a preference for Sequential learning over Global. Turkey is the only nation with a moderate preference for it, with the remaining nations demonstrating weak preferences of varying degrees. With the group average score for the group is -1.63

The learning styles of engineering students across all nations were found to be Active, Sensing, Visual and Sequential, supporting Felder's (Felder, 1988) [4]; Felder & Spurlin, 2005 [6] claims of a 'typical' engineering style. Felder & Brent (2005) [3] suggested that the declining interest in engineering education might be related to the mismatch in teaching styles and student learning styles. They notice that most engineering students are Active, Sensing, Visual and Sequential while most engineering instruction is Reflective, Intuitive, Verbal and Sequential.

### 4.3 Comparison between Learning Styles and Culture

Using the selection criteria of Pearson  $r > 0.5$  and  $p < 0.05$  shows that four out of the sixteen possible relationships can be considered substantial (as highlighted). Table 5 below ranks those four relationships in terms of strength and significance.

Table 5: Significant Culture-Learning Style Relationships

Rank of Strength and Significance of Relationship	Relationship
1 <sup>st</sup>	MAS vs. Active-Reflective dimension
2 <sup>nd</sup>	MAS vs. Sensing-Intuitive dimension

3 <sup>rd</sup>	UAI vs. Sensing-Intuitive dimension
4 <sup>th</sup>	IDV vs. Sequential-Global dimension

The positive correlation between masculine traits and intuitive and reflective learning preferences is at first a little surprising since the predilection to competitive/aggressive behaviour is often associated with reckless or hasty actions. However this correlation seems to indicate that for engineering students their preference would be to gather, evaluate and reflect on the evidence before rushing to action.

The correlation between uncertainty avoidance and sensing is opposed by Kolb & Joy's (2008)[9] findings, which suggest that Uncertainty Avoidance positively correlates with Intuitive learning, not Sensing. However they were studying experiential learners with experience in practice as compared with 'raw' undergraduates. This may reflect the journey in education between the synthesised rules-based way in which engineering is taught and the more ambiguous intuitive way it is practiced.

The relationship between Individualism (or Collectivism) and the Sequential-Global dimension can be partially rationalised on a simplicity versus complexity argument. Felder (1988) [4] stated that Global learners have a stronger ability to deal with complex problems, as they are not confined by the somewhat rigid and stepwise approach of Sequential learning. Therefore, individuals from socially complex, Collectivist societies may develop a 'big picture' approach of dealing with the social world, thus favouring a Global style.

## 5 CONCLUSIONS

Comparing the findings of the study against the initial objectives, the following conclusions can be deduced:

Comparing UK and Yemeni students both populations had the same Felder learning style preferences but to different degrees with the Yemeni students tending to be less Active and Sequential and more Sensing compared to the UK. A heavy reliance on computers for instruction was suggested as a possible reason for the lack of difference in the fourth, Visual-Verbal dimension.

Comparing the learning style profiles of nine nations it was concluded that engineering students possess Active, Sensing, Visual and Sequential learning styles, across 8 out of the 9 nations investigated. This supports the idea that there exists a typical learning style profile for engineering students.

The study compared the learning style profiles against the cultural dimensions for each of the nine nations, and found the following relationships significant:

- Cultures with high Masculinity values prefer Intuitive and Reflective learning, whereas those with high Femininity values prefer Sensing and Active learning.
- Cultures with high Uncertainty Avoidance prefer learning via Sensing as opposed to Intuition.
- Highly Individualistic cultures will tend to prefer learning Sequentially, whereas Collectivist cultures prefer Global learning.

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