Learning Styles of Non-Science and Technology (S&T) Students on Technical Courses

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ABSTRACT

This study seeks to identify learning styles of students who have little or no background in Science & Technology subjects and are taking technical courses at university level. Understanding students' preferred learning styles will help instructors in developing curriculum and teaching techniques to suit students' needs. The objectives of the study are: 1. To identify the preferred learning styles of non-Science and Technology (S&T) students on technical courses. 2. To examine the differences in learning styles between male and female students, their academic achievements, and their programs of study. The study poses two research questions: 1. What is the preferred learning style of non-S&T students on technical courses? 2. Are there significant differences in learning styles between the students' gender, their programs of studies and the academic achievements of the technical courses? The instrument used to identify students' learning styles is Barsch Learning Style Inventory (BLSI) invented by Jeffrey R. Barsch, EdD (1996) which can be easily completed by students. A group of 200 students from Faculty of Information Management, Universiti Teknologi MARA, Malaysia, who registered for the course Database Management System in semester 2009/2010 were invited to take part in the study. They were asked to answer 24 statements in BLSI instrument, at the beginning of the semester. A total of 122 completed responses were used for data analysis using Excel and descriptive statistics. The findings indicate that most students prefer Visual learning style and least number of them prefer Kinesthetic learning style. This result applies to all male and female students in all programs of studies and for different levels of academic achievements. The findings are useful for curriculum designers, instructors, lecturers and policy makers who are involved in one way or others in teaching and learning, and designing the curriculum. Most of all, the students themselves can take appropriate steps to enhance their capability to learn by knowing which learning style best suits their natural preference. Further research should be conducted to more, if not all students, so that more data can be used to further verify the reliability and validity of the Barsch instrument among Malaysian students, and to compare with previous studies from other students in other countries.

Keywords: LIS Education, Malaysia; Learning Styles, Malaysian students; Learning Styles, LIS students; Technical Courses, UiTM; Barsch Learning Style Inventory, Malaysian students.

INTRODUCTION

In education, the issue of how best to teach that will result in optimum learning among the learners has been the topic of educators' interest and research for the past centuries. Teaching is not about what and how much knowledge the teacher is able to impart, rather it is about how much the students learn and understand. Effective learning and teaching are not an easy task, particularly when students are from various backgrounds and possess different skills. For example, teaching technical courses to first year university students who graduated from non-Science and Technological (S&T) streams in secondary education. The instructors face challenges in teaching while students face difficulties in understanding the contents of the technical courses.

In our attempt to equip ourselves to face this challenge, we began to examine research on teaching techniques in order that we can modify our teaching styles to suit students so that they can learn better. That is when we realize that teachers cannot use any teaching style until they are aware of their students' learning styles. Hence, we need to first embark on identifying our students' learning styles before we proceed to the next step of teaching styles. This paper is the account of our study on learning styles of a group of non-S&T students who registered for the technical course 'Database Management Systems (IMS504)' at the Faculty of Information Management, Universiti Teknologi MARA, Malaysia (formerly known as School of Library and Information Science, Institut Teknologi MARA, reputed to be Malaysia's pioneer in Library & Information Science education provider).

Currently, there are various learning and teaching styles that are being practiced in the education environment (Krieg 1999). Previous research has shown that teachers' understanding of their students' preferred learning styles can influence and contribute to the improvement and enhancement of the students' understanding of what is being taught. Our research on students' learning styles is in line with Malaysia's Ministry of Higher Education's Seven Core Thrusts (MOHE 2010), one of which puts strong emphasis on improving the quality of teaching and learning.

Problem Statement

It is common that students who did not learn some science subjects during their secondary education experience difficulties in learning technical courses during their university years. They pose big challenges to instructors who teach technical courses. Consequently, it is common to see high failure rates and high dropout rates among these students who take technical courses. There may be many factors that contribute to students' difficulties in learning technical courses which need to be identified before we can suggest ways to solve them. The students may come from different backgrounds, be they academic or socio-economic, which can lead educators into conducting specific research on particular issues of interest. In this study, we consider our priority to be: understanding the students' preferred learning styles before we can develop strategies and syllabus to suit their needs. This study seeks to identify students' preferred learning styles so that this knowledge can help us to develop the course contents and teaching styles that best meet their needs. Previous studies have been conducted on learning styles of students in Malaysian universities, but none of the research explored this issue among non-S&T students taking technical courses. Therefore, it is timely that this study is carried out in Malaysia and at the Faculty of Information Management, Universiti Teknologi MARA (UiTM), where non-S&T students are required to take technical courses.

Objectives of the Study and Research Questions

The study has two main objectives:
1. To identify the preferred learning styles of non-Science and Technology (S&T) students on technical courses.
2. To examine the differences in learning styles between male and female students, their academic achievements, and their programs of study.

Two research questions are posed: 1. What is the preferred learning style of non-S&T students on technical courses? 2. Are there significant differences between the preferred learning style and the students' gender, their programs of studies and the academic achievements of the technical courses?

Significance of the study

By understanding students' preferred learning styles, instructors are in a better position to develop appropriate curriculum content and to formulate teaching strategies to match students' preferred learning styles. This will lead to learners' ability to improve their learning and perform better in the subject previously deemed difficult.

The findings from this study contribute to a new knowledge in the literature of learning styles especially on the non-S&T students taking technical courses. The findings are useful to various stakeholders in education planning, curriculum design and curriculum implementation, in addition to policy makers and administrators in higher education. Most importantly, students will benefit from the knowledge about their own learning style and can take steps to modify their habits and materials for optimum learning. Besides providing more insights in understanding the learning styles among the non S&T students on technical course, the study also provides an extension in LIS education and paving the way for further research in this critical area, i.e. teaching and learning in LIS.

Definition of Terms

The following definitions are applied in the study and explained in alphabetical order:

Barsch Learning Styles Inventory (BLSI), created by Jeffry Barsch, Ed.D, (1996), refers to the instrument used to identify an individual's learning style. It is a simple instrument which takes about 10-15 minutes to complete by students in colleges / universities to assess their preferred learning style. The students have to answer the questions based on the statement of learning style preferences, namely: Visual (V), Auditory (A) and Kinesthetic (K). The answers from students are added up to indicate the scores befitting a particular learning style, whether V, A or K. Barsch explained that students who are identified as Visual learners, learn best by seeing the study materials in whatever forms, i.e. charts , graphs, maps, notes, films. The Visual learners may have artistic ability as they have strong sense of color, pictures, flow charts, diagrams and visualization, and they write out everything for frequent and quick visual review. The Visual learners also may have difficulties with spoken directions, sounds and spoken words. Students who are Auditory learners prefer listening and need to hear and speak before they can read and write. They prefer using audio tapes for reading and lecture notes, and learning by interviewing or participating in discussions. The Auditory learners also may have difficulties with written directions, reading the body language or facial expression. On the other hand, students with high Kinesthetic scores learn best by involving their body in the process of learning. They prefer hands-on and experiential learning. They learn better when physical activity is involved. The Kinesthetic learners have difficulty sitting still, and need frequent breaks during study periods.

Non Science & Technology students refer to students who do not have any, or have little science and technology background during their high school or pre-university education. They are from Management / Accounting / Business background. They form a major section of student population in the Faculty of Information Management.

Sijil Pelajaran Malaysia (SPM) refers to Malaysia's Certificate of Examination awarded to students (normally ages 17 and above) who take this exam in Malaysian secondary schools. The results from this examination are used as the main qualification to enter colleges or universities in Malaysia.

Sijil Tinggi Persekolahan Malaysia (STPM) refers to Malaysian Higher School Certificate awarded to students (normally ages 19 and above) who take this exam in Malaysian secondary schools. The result from this examination will be used as the main qualification to enter colleges or Universities in Malaysia.

Technical course refers to the subject such as Computers, Computing, Information, Communication & Technology (ICT) courses. In this study it refers to Database Management System course (IMS504) offered at the Faculty of Information Management, UiTM.

LITERATURE REVIEW

Learning Style Instruments

There are several learning style instruments being used to identify the preferred way of learning of an individual. Krieg (1999) defined learning style instruments as, '*questionnaires that assist an individual to evaluate their best way of learning'.* His review of Learning Style Instrument lists 8 types of instruments available online and another 5 instruments available on the web for students to print and do self test offline. These instruments share some common features and some have their own uniqueness unlike others. Students can choose which test is of interest to them, answer the questions, add up the scores, and use the results for their own benefits. Learning Styles by Felder & Silverman identifies the learning styles as active/reflective, sensing/intuitive, visual/verbal, and sequential/global. Learning style inventory by Kolb assesses the body/kinesthetic, interpersonal, intrapersonal, logical/mathematical, musical/rhythmic, verbal/linguistic and visual/spatial. Learning style inventory by Dunn assesses the environmental, emotional, sociological, physiological processing of learners. Barsch learning styles inventory identifies four learning styles -visual, auditory, tactile, and kinesthetic.

These learning style instruments also have been reviewed by several researchers. Krieg reviewed some of the instruments, such as ATLAS: Learning Strategies (Learning Style) by

Gary J. Conti and Rita C. Kolody, Index of Learning Styles by Richard M. Felder and Linda K. Silverman and Brain Works by Synergistic Learning Incorporated. He found that each of the instruments has a theoretical basis although many do not specifically acknowledge their foundational theory or the responsible person. A team from Learning & Skills Research Centre (Coffield et al, 2004) have reviewed the literature on learning styles and examined in detail 13 of the most influential models such as Cognitive Style Index (CSI) by Allinson and Hayes, Motivational Style Profile (MSP) by Apter, Learning Style Questionnaire (LSQ) and Inventory (LSI) by Dunn & Dunn, and Learning Style Questionnaire (LSQ) by Honey & Mumford. Their report concludes that it matters fundamentally which instrument is chosen. It implies serious impact in teaching and learning, and should be of concern to learners, teachers and trainers, managers, researchers and inspectors.

Several studies on learning styles have been found using Barsch Learning Styles Inventory (BLSI) instrument among various groups. Erton (2010) used Maudsley's Personality and BLSI instruments to clarify the relations between personality traits, language learning styles and success in foreign language achievement. Erton found that there was no significant relationship between the personality traits (introversion-extroversion) of the learners in their foreign language achievement. Another finding was that visual students were the most successful compared to other learning styles. Sizemore & Schultz (2005) used BLSI instrument to describe the learning styles of nursing students and to correlate the learning styles with ethnicity and gender. They found that there were ethnic and gender differences in learning styles of nursing students. The result showed that the predominant learning style for all students was visual, but males had a significantly greater incidence of the visual style. Male students as a group were more homogeneous in learning style than were female students. Means (2010) examined technology implementation practices associated with student learning gains. Her findings highlight the importance of the principal's support, teacher collaboration around software use, classroom management practices by the teacher and the use of software-generated student performance data.

Learning Style Research in LIS Education

Learning styles in the field of Library & Information Science (LIS) was reported at the 68th IFLA Council & General Conference during 18-24 August (Adkins & Brown-Syed 2002). Adkins and colleagues used the 44 item instrument of Felder and Solomon to identify learning styles of 56 graduate students at the University of Buffalo, New York. They found that the majority of respondents (44%) preferred Visual learning style. Another particular research on LIS students using Kolb's Learning-Style Inventory was conducted among Masters' students in the School of Library and Information Sciences at the University of North Texas, USA. (Simpson 2004). It was found that learning style significantly impacts students' enjoyment level while class participation does not. The results of classroom studies indicate that the use of interactive visualization in a homework context can result in significant growth of knowledge. The vast majority of the students recognize the value of interactive visualization and recommend its use in the context of information retrieval courses. The study also demonstrated that visualization focusing on less known and harder to understand topics causes a larger growth in knowledge and is perceived as more useful. This result suggests placing higher priority on the development of visualization tools for harder to understand topics.

There have been other studies on learning styles among students in the field of Library and Information Science (LIS) education. However these studies deal with different approaches or different aspects of learning rather than specifically on learning styles. Two recent studies at the University of the West of England mention a mixture of learning and teaching style that highlight the involvement of practitioners in teaching (Richardson A, 2010). Another study emphasizes work-based learning (Chelin J, 2010) in order to meet student and employer needs in terms of the skills required in their future work. Two other studies conducted by Kazmer (2005, 2007) emphasized the impact of community-based learning and social networking between students and the community on learners, in particular online learners in the United States. Another culturally-inclined paper (Abdullahi 2008) presents ways by which LIS educators can create a better learning environment base inclusive of all cultures represented in the classroom. It redefines diversity of library education in a culturally mediated teaching and learning environment. This is based on the conviction that students who are responsive to the

needs of their diverse communities will be better equipped to become future change agents to their institutions and professions.

Learning Style Research on Malaysian Students

Studies done on Malaysian students can be found in 14 Master's and Doctoral theses submitted to University of Malaya and University Putra Malaysia. Ten of the theses deal with language teaching and learning on campus, three studies are related to Computer Science students' learning, and one is about Engineering students. Thambusamy (2002) investigated the ESL learning styles preferences and the teaching style preferences of a selected group of students and lecturers of UiTM's program in English as a Second Language. She found that the course and language proficiency did impact significantly upon the ESL learning style preference of the students, while the gender was not a significant variable in these students' style preferences. In general, this study showed that learning style preferences of the students were unaffected by the teaching styles employed by the instructors. Another study by Syed Jamal Abdul Nasir (2006) examined the learning styles of multi-ethnic students in four selected universities in the Klang Valley of Malaysia in terms of gender, program of studies and academic achievement levels, using a modified Honey and Mumford Learning Style Questionnaire. The results showed that reflector style was the most preferred learning style by both male and female students, while the activist style was the least preferred. The Arts and Science students seemed to exhibit similar patterns of learning styles. He also concluded that the learning styles appeared to have no relationship with academic achievements; the learning styles were not significantly different between male and female students, nor between Science and Arts students.

It can be seen from the review of previous studies that no one study has been done on LIS students, in particular among students from non-S&T backgrounds who take technical courses. Hence this study is the first of its kind to identify learning style preferences among non-S&T students in Library & Information Science education.

RESEARCH METHODOLOGY

Instrument and Method

Barsch Learning Style Inventory (BLSI) was used as the instrument to identify the preferred learning style by students. It is a simple and convenient set of questions which takes approximately 10-15 minutes to complete. The learning styles tested are visual (V), auditory (A) and kinesthetic (K). There are 24 statements each of which has been assigned scores: 5 points for often true, 3 points for sometimes true and 1 point for seldom preferred. The students select the description /statement that suit them and write the score of their selected items. After selecting all statements, the students will total up the scores of each of the three learning styles. The highest score will be the student's most preferred learning style. This can be either Visual (seeing things), Auditory (hearing them) or Kinesthetic (actually performing the task). The BLSI instrument is shown in the appendix of this paper.

Besides the BLSI scores, the students' profile and academic performance are gathered from the faculty's official records on students. Students' program of study, gender, and academic achievements were cross-tabulated with the scores obtained from BLSI.

Population of the Study

This study was conducted among 200 students who enrolled in Database Management System (IM504) course at the Faculty of Information Management, Universiti Teknologi MARA in semester 2009/2010. Currently the faculty offers four Bachelor degree programs: Library and Information Management (IM220), Information System Management (IM221), Records Management (IM222) and Information Resource Center Management (IM223). The main requirements for entering Bachelor Programs are Diploma, Matriculation or STPM, and the students must have credit in English and pass mathematics or additional mathematics in their SPM level. Majority of the students are not from Science or Mathematic stream during their high school education, and achieved average or minimum grade in Science or Mathematics. The

IM221 students who have Diploma before, have to register IMS504 course as their core subject in semester 3, while the IM221 students who have STPM qualification have to register for IMS504 in semester 4. Students from other programs can take IMS504 as elective or minor subject in the final year of their study. A total of 200 BLSI instruments were distributed to these students in IMS504 classes at the beginning of semester 2009/2010. Not all responses were completed by students; hence a total of 122 (61%) responses were used for data input and data analysis.

DATA ANALYSIS & FINDINGS

Students' Profile

This section summarizes the profile of respondents in terms of gender and program of study. Table 1 shows that majority of the respondents are female (89 or 73%) and the minority (33 or 27%) are male. This is not surprising because the number of female students is greater than male students in all Malaysian public universities.

Table 1: Number of respondents by gender

	Gender	Frequency	%	Valid %	Cumulative %
	FEMALE	89	73	73	73
	MALE	33	27	27	100
	Total	122	100	100	

Table 2 shows the largest number of respondents are from the IM221 program (96 or 79%), the rest (26 or 21%) are from three other programs, namely: IM220, IM222 and IM223. Among the students from IM221, 54 (57%) are from post-Diploma background, 34 (35%) from post-STPM and 8 (8%) are off-campus students. All students have enrolled in the course Database Management System (IM504).

Table 2: Number of respondents by program of study

Program of Study	Total	%	Total	%
IM221	96	79	-	-
- Post-Diploma	-	-	54	57
- Post- STPM	-	-	34	35
- Off-Campus	-	-	8	8
Others (IM220, IM222, IM223)	26	21	-	-
Total	122	100	96	100

Students' Preferred Learning Style

The respondents were asked to answer the statements listed in BLSI on their preferred learning style for IMS504 course at the beginning of the semester. The three learning styles were tested in BLSI: Visual (V), Auditory (A) and Kinesthetic (K). Table 3 shows that the most preferred learning styles by the students is Visual (71 students or 58.2%), followed by Auditory (19 students or 15.6%) and the less preferred learning style is Kinesthetic with (14 students or 11.5%). There are also students who prefer a mixture of styles: 10 students (8.2%) choose Visual and Auditory (VA), and 6 students (4.9%) choose Visual and Kinesthetic (VK). Two students (1.6%) choose a mixture of three learning styles (VAK).

The findings show that the most preferred learning style is Visual, and the least preferred is Kinesthetic. This finding is consistent with that of previous studies done by Erton (2010) and

Sizemore & Schultz (2005) who found that the Visual is the most preferred learning style among their student respondents.

Table 3: Students' Preferred Learning Style

Learning Styles	Frequency	%	Valid %	Cumulative %
Visual	71	58.2	58.2	58.2
Auditory	19	15.6	15.6	73.8
Kinesthetic	14	11.5	11.5	85.2
Visual & Auditory	10	8.2	8.2	93.4
Visual & Kinesthetic	6	4.9	4.9	98.4
Visual & Auditory & Kinesthetic	2	1.6	1.6	100.0
Total	122	100.0	100.0	

Learning Style and Students' Gender

Table 4 shows that Visual is the most preferred learning style by both female (54 or 60.7%) and male students (17 or 51.5%). Those who prefer Auditory make up 13 females (14.6%) and 6 males (18.2%). The least preferred learning style is Kinesthetic for female (8 or 9.0%), while equal number of male students (6 or 18.2%) prefer Auditory and Kinesthetic. There are also 2 female students who prefer all three learning styles. However this preference for a mixture of 3 styles does not apply to any male student.

Table 4: Students' Learning Style and their gender

Gender		*Auditory*	Kinesthetic	Visual	Visual & Auditory	Visual & Auditory & Kinesthetic	Visual & Kinesthetic	Total
FEMALE	Count	13	8	54	7	2	5	89
	% within gender	14.6%	9.0%	60.7%	7.9%	2.2%	5.6%	100.0%
MALE	Count	6	6	17	3	0	1	33
	% within gender	18.2%	18.2%	51.5%	9.1%	.0%	3.0%	100.0%
Total	Count	19	14	71	10	2	6	122
	% both gender	15.6%	11.5%	58.2%	8.2%	1.6%	4.9%	100.0%

The findings that most female and male students preferred Visual learning style appear to concur with those of previous studies conducted by Thambusamy (2002) and Syed Jamal Abdul Nasir, (2006) who also found that the learning styles were not significantly different between male and female students. However, this result differs somewhat from that of Sizemore & Schultz (2005) where the male students had a significantly greater frequency of the Visual style than female students.

Students' Learning Style and Their Program of Study

Table 5 shows that most students in the group of post-Diploma program prefer Visual (31 or 57.4%), and the least number of students (7 or 13.0%) prefer Kinesthetic. The same finding applies to post-STPM students where Visual (20 or 58.8%) is the most preferred learning style,

and the Auditory (2 or 5.9%) is the least preferred learning style. Results from other groups show similar pattern: Visual is the most preferred learning style (18 or 69.2%). Overall, the most preferred learning style is Visual and the least preferred is Kinesthetic. There are a few students from post-STPM group who prefer a mixture of all three learning styles (2 or 5.9%). However, Visual learning style is consistently the most preferred learning style, either on its own or in combination with other styles.

Table 5: Students' Learning Style and their program of study

Group		Auditory	Kinesthetic	Visual	Visual & Auditory	Visual & Auditory & Kinesthetic	Visual & Kinesthetic	Total
						Learning Styles		
IM221 -Post Diploma	Count	12	7	31	2	0	2	54
	% within group	22.2%	13.0%	57.4%	3.7%	0.0%	3.7%	100.0%
IM221 -Post STPM	Count	2	6	20	2	2	2	34
	% within group	5.9%	17.6%	58.8%	5.9%	5.9%	5.9%	100.0%
IM221 -Off Campus	Count	3	1	2	1	0	1	8
	% within group	37.5%	12.5%	25.0%	12.5%	0.0%	12.5%	100.0%
Others (IM220, IM222, IM223)	Count	2	0	18	5	0	1	26
	% within group	7.7%	0.0%	69.2%	19.2%	0.0%	3.9%	100.0%
Total	Count	19	14	71	10	2	6	122
	% all groups	15.6%	11.5%	58.2%	8.2%	1.6%	4.9%	100.0%

The findings show that the most preferred learning style by students of all programs is Visual. The post-Diploma students' least preferred learning style is Kinesthetic, while that of the post-STPM students' is Auditory. There are also some students from post-STPM group who have been identified with preferred combination of Visual, Kinesthetic and Auditory learning styles.

Students' learning style and their academic achievements

Table 6 shows that group A students preferred Visual (12 or 57.1%) as their learning style, followed by Auditory (3 or 14.3%) and Kinesthetic (3 or 14.3%). There are also A students who preferred combination of two learning styles: Visual Auditory (2 or 9.5%) and Visual Kinesthetic (1 or 4.8%). The B students also prefer Visual (48 or 58.5%) learning style, compared to Auditory (14 or 17.1%) and Kinesthetic (6 or 7.3%). The C students prefer Visual (11 or 57.9%), Kinesthetic (5 or 26.3%) and Auditory (2 or 10.5%). The findings show that most preferred learning style for all grade groups is Visual (71 or 28.2%). However the least preferred learning style of grade A and grade C students is Auditory while the least preferred for the grade B students is Kinesthetic. This finding is consistent with that of Syed Jamal Abdul Nasir (2006) which reported that his subjects' learning styles had no relationship with their academic achievements.

Table 6: Students' preferred learning style and grade achievement

Grade		Auditory	Kinesthetic	Visual	Visual & Auditory	Visual & Auditory & Kinesthetic	Visual & Kinesthetic	Total
								Learning Styles (header span)
A	Count	3	3	12	2	0	1	21
	% within grade	14.3%	14.3%	57.1%	9.5%	0.0%	4.8%	100.0%
B	Count	14	6	48	7	2	5	82
	% within grade	17.1%	7.3%	58.5%	8.6%	2.4%	6.1%	100.0%
C	Count	2	5	11	1	0	0	19
	% within grade	10.5%	26.3%	57.9%	5.3%	0.0%	0.0%	100.0%
Total	Count	19	14	71	10	2	6	122
	% all grade	15.6%	11.5%	58.2%	8.2%	1.6%	4.9%	100.0%

CONCLUSION

Summary

This study has identified the learning styles preferred by the non-S&T students on a technical course from the aspects of their gender, program of studies, and their level of academic achievements. Findings indicate that the most preferred learning style of the Information Management students of Database Management System course is Visual and the least preferred learning style is Kinesthetic. Some students preferred a combination of Visual, Kinesthetic and Auditory learning styles, and this group consists of post-STPM students. Most of female and male students prefer Visual learning style and least preferred Kinesthetic learning style. This study also indicates that the Visual style is the most preferred learning styles in all programs of study. However, there are differences on the least preferred learning style, where the post-Diploma students least prefer Kinesthetic style, and the post-STPM students least prefer Auditory style. The most preferred learning style for every grade achieved by the students is Visual. However, the grade A and C students least prefer Auditory style, while grade B students least prefer Kinesthetic style.

Implications of Findings

The above findings have implications for instructors and curriculum planners in their consideration regarding the approach to teaching to suit students' preferred learning style. As the results show that most of the non-S&T students are Visual learners, teaching materials and learning processes should be designed to take advantage of visual preference to enhance the students' understanding on technical courses. The students themselves can also take advantage of this awareness in making their learning materials more visually appealing to them, such as use bright color to mark reading passages, use stickers to mark sections of key ideas, use picture, graphs to illustrate their ideas. On the other hand, students who prefer Auditory style will learn best by using audio tapes, music tape to record lectures, notes, and discussions to replay them when needed later. Whereas the Kinesthetic learners should involve themselves physically in doing activities to express ideas and reinforce understanding – learning by doing.

Further Research

As this study is limited to only students in one faculty at a university, findings cannot be generalized to a larger population. Further research on learning styles should be carried out among students from various faculties in order to discover whether this finding will apply to other

groups of students. A more systematic sampling of respondents to represent the whole population of students with high risk (face difficulties in learning technical courses) can be conducted. The results from such studies will lend more meaningful data for educators, curriculum designers and policy-makers in their effort to alleviate student's achievements on campus. Such studies will also be useful in reinforcing the validity and reliability of instruments to identify learning styles among individuals.

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APPENDIX

Barsch Learning Style Preference Form

Students have 24 statements to answer. Each statement has been assigned 3 different scores, one of which must be chosen. When all answers are completed all scores are added up and the preferred learning style will be identified. The 3 scores are:

5 points = The statement is often true of me.
3 points = The statement is sometimes true of me.
1 point = The statement is seldom true of me.

Read each statement carefully and select the best answer that applies to you.

Section I - Visual
1. Follow written directions better than oral directions.
2. Like to write things down or take notes for visual review.
3. Am skillful and enjoy developing and making graphs and charts.
4. Can understand and follow directions on maps.
5. Can better understand a news article by reading about than by listening to it on the radio.
6. Feel the best way to remember is to picture it in your head.
7. Grip objects in your hands during learning periods.
8. Obtain information on an interesting subject by reading related materials.

Section II - Auditory
9. Can remember more about a subject through listening than reading.
10. Require explanations of graphs, diagrams, or visual directions.
11. Can tell if sounds match when presented with pairs of sounds.
12. Do better at academic subjects by listening to tapes and lectures.
13. Learn to spell better by repeating the letters out loud than by writing the word on paper.
14. Would rather listen to a good lecture or speech rather than read about the same material in a book.
15. Prefer listening to the news on the radio than reading about it in the newspaper.
16. Follow oral directions better than written ones.

Section III - Kinesthetic
17. Bear down extremely hard when writing.
18. Enjoy working with tools or working on models.
19. Remember best by writing things down several times.
20. Play with coins or keys in pockets.
21. Chew gum, snack, or smoke during studies.
22. Do a lot of gesturing, am well coordinated.
23. Am good at working and solving jigsaw puzzles and mazes.
24. Feel very comfortable touching others, hugging, handshaking, etc.