

# Suitability of Training Programme Based on Integrity Traits Identification

Mohamad Farhan Mohamad Mohsin, Faudziah Ahmad, Aniza Mohamed Din, Ku Ruhana Ku-Mahamud, Roshidi Din

**Abstract-** Training programs for teacher's development in Malaysia are organized ever year. The selection of teachers to attend trainings is currently done randomly, by rotation and not based on their work performance. This poses a problem in selecting the right teacher to attend the right course. Up until now, there is no intelligent model to assist the school management to determine the integrity level of teacher and assign them to the right training program. Thus, this study investigates the integrity traits of teacher using association rule technique with an aim, which can assist the school management to organize a training related to teachers' integrity performance and to avoid sending the wrong teacher for the training. A dataset of Trainees Integrity Dataset representing 1500 secondary school teachers in Langkawi Island, Malaysia in the year 2009 were pre-processed and mined using apriori. Mining knowledge was analyzed based on demographic and integrity trait of teacher. The finding indicates that adaptability and stability are the weakest integrity trait among teachers. Teachers from the age group of 26 - 30 years are found to have lower integrity performance. However, other demographic factor such as gender, race, and grade position of teachers were not able to reflect their low integrity level in this study. Findings from this study can be used as guideline for school management to propose suitable training programs for teacher to improve their integrity mainly on adaptability and stability traits.

**Index Terms**— association mining, apriori, big five model, data mining, education training, teacher's integrity

## 1 INTRODUCTION

INTEGRITY is a vital trait that everyone must own to perfectly complete tasks. This includes teachers who play a very important role to nation. They are responsible to develop valuable citizens and educate students with a high-quality education. To teach students mainly at the young age is not an easy job. Therefore, teachers must have high integrity, and they must establish integrity within the school to accomplish the goal. Without the presence of integrity, teachers will definitely fail to do it [1].

To maintain the high level of integrity, the government through the Ministry of Education (MoE) has arranged many programs for teacher's development through training, workshop, and seminar. Currently, the training program is randomly organized to fit the yearly calendar without considering the right teacher for the right training. The selection of trainees to attend training is done randomly, sometimes by rotation and most of the selection is not based on their work performance. Tailored to [20], there are many training programs available but there is no systematic way to ensure all teachers acquire and continue to develop the knowledge they needed.

Even though teachers are evaluated through the yearly performance appraisal, the inflexibility of the system to identify less motivated teacher will burden the school management. Up until now, there is no intelligent model in determining the integrity level of teachers and assign them to the right training program.

As a result, this will create difficulties for the school management to identify problematic teachers and sending the wrong ones to attend the training. If the requirement of training program is mismatched with the trainee, there is a high possibility that the objective of the training cannot be achieved. Teachers who possess such negative attitudes would not be suitable for an integrity program. If they were selected randomly, there would be a mismatch of supply and demand of needs which would cause failure in the integrity training programs to achieve their goals. According to several studies, selecting a wrong person can increase a cost between 30% and 200% of a person's annual salary. If a role worth \$70,000 a year is filled with the wrong candidate, it could end up costing between \$21,000 and \$140,000 – a loss most businesses cannot afford to make [2]. Even though there is a keen action from the government to raise the teacher's integrity, it appears to be a number of reports that some teachers are unable to perform their tasks efficiently when they are having a problem with students and also some of them might involve in crimes [9, 11].

Integrity is viewed as the quality of having an intuitive sense of honesty and truthfulness of a human in completing task. It is normally a product of culture with the relation of good traits and discipline of human beings in all situations [12]. As the result of high integrity, human beings will be more accountable and responsible towards his job and struggle to reach his objective. It is the key of success to everyone, and many organizations have benefited an enormous performance increase when their employees own good integrity behavior. As stated in [1] nothing can work without the presence of integrity. In relation to integrity, it is stressed out that the integrity among teachers is critically important [17] and sometimes the solution towards integrity issues is difficult to be answered. Finding a teacher with high integrity characteristic is not easy since there is no agreement on what makes a teacher have a high quality attitude

- All authors are researchers at the School of Computing, UUM College of Arts & Sciences, Universiti Utara Malaysia, 06010 UUM Sintok, Kedah Malaysia.
- Inquiries can be emailed to {farhan; fudz; anizam; roshidi; ruhana}@uum.edu.my.

in school. Such criteria like the experiences that the teacher has, the education level, and the performances achieved by their students can be used to measure his integrity. Besides that, the integrity test such as the Big Five Model [3] and personality test [16] also can be a guideline to measure the level of teacher's integrity.

High quality teaching is essential to improving student outcomes and reducing gaps in student achievement. In school, teachers must uphold the highest integrity and be a good role models to their students at all times. Their responsibility towards students are not limited during school hours but continued after the class end. Teachers are the nearest people who are examples for students other than their parents. As an idol for students, teachers need to be equipped with a good package of moral quality. For the reason to attract students to behave nicely, teachers must have a quality mind and good attitude to impress students. They need to be familiar with the students as well as the school community to be able to successfully educate students. Good quality teachers must be able to target and plan how to manage their students to become good quality students [10, 13]. Besides that, they also need to be very understanding and show their respect to the students' behavior [14]. High quality teaching is essential to improving student outcomes and reducing gaps in student achievement. Stated by [17], an effective teacher is capable of inspiring greater learning gains in their students compared to a teacher with low teaching quality. Those traits have a strong relationship with teacher's integrity. With the high capacity of integrity, teacher will be motivated to educate student and help the country to develop human capital. It will not only benefit the students and country, but also the teacher itself in providing them with meaningful appraisal, encourage professional learning and growth [20].

Since the MoE faces problems in discovering problematic teachers related to integrity, a model to identify the weakest integrity trait of teacher is proposed in this paper. The aim of this model is to assist the school management to discover integrity traits that are mostly lacking among teachers and proposes a suitable training program for them. To achieve that, data mining algorithm called apriori is used to mine Teacher Integrity Dataset (IID). The dataset consists of 1500 information about demographic and integrity score of secondary school teachers in Langkawi Island, Malaysia in the year 2009.

This paper is organized as follows. Section II outlines the basic notion of AR. The model development of the study is discussed in section III. The experiment and result will be presented in section IV and the final section concludes this work.

## 2 ASSOCIATION RULE

In this section, the basic of association rule (AR) mining is discussed. Association rule mining or AR was first inspired by Agrawal [18] in apriori algorithm. In AR, it relies on the concept of "frequently occurred together" which refers to process of the identifying of frequent items that occur in a database of transaction. Each item ( $i_j$ ) in a transaction is an important feature that contributed to the computation of item set and generation of rules. Basically, let  $I = \{i_1, i_2, \dots, i_m\}$  be a set of items

and  $D$  be a set of transactions, where each transaction  $T$  is a set of items such as that  $T \subseteq I$ . An AR is an implication of form  $X \rightarrow Y$ , where  $X \subset I$ ,  $Y \subset I$ , and  $X \cap Y = \emptyset$ . The rule  $X \rightarrow Y$  has support  $s$  in the transaction  $D$  if  $s\%$  of transactions in  $D$  contain  $X \cup Y$ . The rule  $X \rightarrow Y$  holds in the transaction with confidence  $c$  if  $c\%$  of transaction in  $D$  that contain  $X$  also contain  $Y$ . The algorithm depicts in Fig. 1 is the process of generating frequent item set in apriori [18, 19]. AR mining's processes begin with searching for frequent item set with user-specified minimum support and later rules are contrasted by binding the frequent item with its values and class. Strong rules are defined as rules that have confidence more than the minimum confidence threshold. Recently, AR has been used as in various areas mainly when the problem need to be solved requires the identification of important relationship among variables such as the work of [21, 22].

```

Input: database of transactions ( $D$ ); the minimum support count threshold ( $min\ sup$ )
Output: frequent itemsets in  $D$  ( $L$ )

(1)  $L_1 = \text{find\_frequent\_1-itemsets}(D)$ ;
(2) for ( $k = 2; L_{k-1} \neq \emptyset; k++$ ) {
(3)    $C_k = \text{apriori\_gen}(L_{k-1})$ ;
(4)   for each transaction  $t \in D$  { // scan  $D$ 
for counts
(5)      $C_t = \text{subset}(C_k, t)$ ; // get the
subsets of  $t$  that are candidates
(6)     for each candidate  $c \in C_t$ 
(7)        $c.\text{count}++$ ;
(8)   }
(9)    $L_k = \{c \in C_k | c.\text{count} \geq min\_sup\}$ 
(10) }
(11) return  $L = \cup_k L_k$ ;

Function apriori gen( $L_{k-1}$ :frequent ( $k-1$ )-
itemsets)
(1) for each itemset  $l_1 \in L_{k-1}$ 
(2)   for each itemset  $l_2 \in L_{k-1}$ 
(3)     if ( $l_1[1]=l_2[1]) \wedge (l_1[2]=$ 
 $l_2[2]) \wedge \dots \wedge (l_1[k-2]=l_2[k-2]) \wedge (l_1[k-1] <$ 
 $l_2[k-1])$  then {
(4)        $c = l_1 \cup l_2$ ; // join step:
generate candidates
(5)     if
has_infrequent_subset( $c, L_{k-1}$ ) then
(6)       delete  $c$ ; // prune
step: remove infrequent candidate
(7)     else add  $c$  to  $C_k$ ;
(8)   }
(9) return  $C_k$ ;

Procedure has infrequent subset( $c$ : candidate
 $k$ -itemset;
 $L_{k-1}$ : frequent ( $k-1$ )-itemsets); // use
prior knowledge
(1) for each ( $k-1$ )-subset  $s$  of  $c$ 
(2)   if  $s \notin L_{k-1}$  then
(3) return TRUE;
    
```

Fig. 1. Generating frequent item set in apriori [19]

### 3 MODEL DEVELOPMENT

This chapter describes how this study was conducted. The study was divided into three phases which started with data gathering, preparing data for mining and ended with pattern extraction. The details of the phases will be described in the following subsections. Fig. 2 illustrates the data gathering, data preparation for mining and integrity traits extraction of this study.

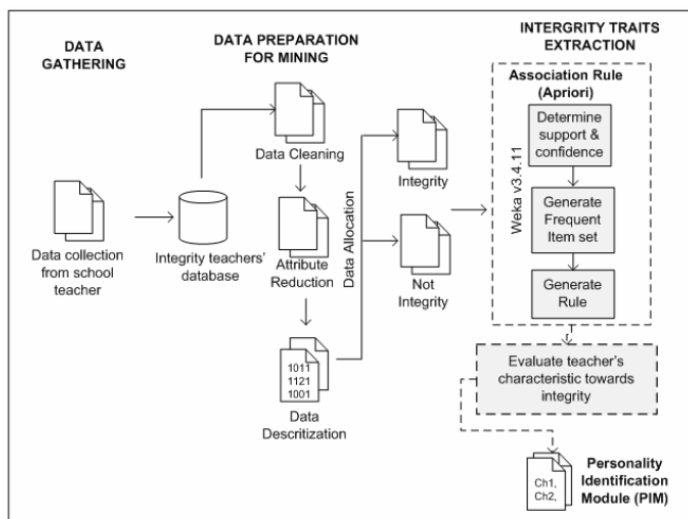


Fig. 2. Phases of the study

#### 3.1 Data Gathering

The first step of this study is to obtain experiment data from school. In this study, a set of filled questionnaires of secondary school teachers in Langkawi Island, Kedah, Malaysia was selected as a case study. The questionnaire was designed by Langkawi Education District Office and it was distributed to teachers while attending training or seminar in the year 2009. There were 1500 respondents and 26 attributes including a decision class. The data set hold two decision class "Integrity" if the accumulative score of integrity test is more than 80% and "Not Integrity" if the score is lesser than 80%. Out of 1500, 36.17% respondents were male and 63.87% were female teachers. Table 1 represents the distribution of respondents based on integrity level. The filled questionnaires were put into excel and named as Trainees Integrity Dataset (TID).

TABLE 1  
DISTRIBUTION OF RESPONDENTS BASED ON INTEGRITY LEVEL

		Decision Class		Total
		Integrity	Not Integrity	
Gender	Female	652	308	960
	Male	395	145	540
Total		1047	453	1500

The TID represents two informations that are demographic background and five key traits on integrity of teachers. The integrity elements are inherited from the Big Five Model

(BFM) [3] which is needed for stability, extraversion, originality, accommodation, and consolidation. Theoretically, the BFM identifies traits and structure of human personality and it acts as a guideline to measure integrity of a human [3]. The model has been widely used in various areas such as motivating a human being. BFM has been found to produce consistent results over the past years and is the basis of characterizing personality [4, 5, 6]. Measuring the integrity of a training candidate can help authority such as employer and training provider to identify the levels of integrity of a person. Table 2 lists the description of integrity traits as stated in [3].

TABLE 2  
INTEGRITY TRAITS BASED ON FIVE FACTOR MODEL [3]

Five Factor Model (BFM)	
<b>Openness</b> (Originality, Imagination, openness to experience) The openness of a trainee towards new experience. Human with openness is said to own more intellect, imaginative, curious, appreciative of art, and sensitive to beauty.	
<b>Conscientiousness</b> (Will to achieve, Consolidation) A tendency to show self-discipline, act dutifully, and aim for achievement against measures or outside expectations.	
<b>Extraversion</b> (Positive Emotionality, Sociability) Related to positive emotions and surgency. It has tendency to seek out stimulation, has engagement with the external world, always enjoy being with people, and often equipped with full of energy as well as an action-oriented individuals	
<b>Adaptability</b> (Agreeableness, Accommodation) Is a social harmony trait and has tendency to be compassionate and cooperative rather than suspicious and antagonistic towards others.	
<b>Need For Stability</b> (Negative Emotionality, Neuroticism) Called as emotional instability that has relation to how a trainee respond to stress, experience negative emotions	

Each of the five integrity element (stability, extraversion, originality, accommodation, and consolidation) in TID is represented by four questions. The questions are labeled with A1-A4 for Extraversion, B1-B4 for Consolidation, C1-C4 for Adaptability, D1-D4 for Stability and E1-E4 for Originality. Each integrity traits holds 20 marks where 5 marks was allo-

cated for each question. Table 3 displays the list of questions of each integrity trait.

**TABLE 3**  
 LIST OF QUESTIONS BASED ON FIVE FACTOR MODEL [3]

Integrity Traits	Questions [Variable]
<b>Extraversion</b>	I will place the interests of the organization above personal [A1]
	I am ready to obey all rules, procedures and laws [A2]
	I fully understand the consequences that would be incurred if I commit an offense [A3]
	I am willing to carry out a task without expecting any reward or consideration [A4]
<b>Consolidation</b>	I will not use official facilities under my power for personal purposes [B1]
	I will not manipulate any important information for their own organizations [B2]
	I may accept error that I do [B3]
	I will adhere to the values of employment, even though it may threaten my life [B4]
<b>Adaptability</b>	I never make any false certificate during the period of my employment [C1]
	I will not highlight the excesses of any ability to be viewed as a success [C2]
	I choose to be honest in my promotion even had the opportunity to get it dishonestly [C1]
	I remain with the current work for interest, pleasure, and job satisfaction. If it is less I would prefer to find another job [C4]
<b>Stability</b>	I will always speak the truth even though in certain circumstances it may be difficult of my life [D1]
	I will always be honest and forthright on job performance feedback requested by the Department either on its own performance or colleagues [D2]
	I am always on time in doing the

	work [D3] I would not preclude any real evidence of the offense to me even in public [D4]
<b>Originality</b>	I will be open to accept any criticism and advice from the Head of Department or colleagues even if the offense committed was minor [E1]
	I will strive to fulfill the promise I made to the Head of Department, particularly in completing the tasks entrusted despite a moratorium on personal and family matters [E2]
	I can be patient, do any work until the end even took a long time, more than the official working hours [E3]
	I can accept anyone into the Head of Department or my colleagues, to try to adjust or change themselves into account, regardless of reputation, ethnicity, race and religion [E4]

For demographic background information, the attributes are gender, age, race, type of school, department, and position grade. Preliminary observation on the raw dataset shows that several attributes were not related to the study; certain values were missing and duplicated. The next step is to pre-process the TID before it can be mined with AR algorithm.

### 3.2 Data Preparation for Mining

The second step of the study is preparing the data for mining. This step involves data preprocessing activities whereby the problem in TID were identified and resolved. During preprocessing task, all dataset were pre-processed where all unknown numeric attributes were replaced with mean value while max value for character attributes. Since the AR algorithm in WEKA only accepts nominal type data, the dataset were then discretized using Boolean reasoning technique [15]. To increase the mining speed and accuracy, only important attribute was given priority for mining and those attributes which were not related to the study were ignored. During the selection process, 20 attributes which represent integrity test score were reclassified into five new groups based on the BFM model [3]. The new groups were stability, extraversion, originality, accommodation, and consolidation. Each attributes represents an integrity question with the maximum score was 5. In this process, the sum score of each attribute based on the type of integrity was aggregated and the total score was 20. For example, the attributes A1, A2, A3, and A4 are the set of integrity question for Extraversion. Let say the score is given as A1=1, A2=4, A3=4, A4=1 then the total accumulative score for Extraversion is 10/20. Based on the accumulative score, the value is reclassified into two classes, either "15-20" or "0-14". The "15-20" group was considered as high score and "0-14" as

lower. Fig. 3 summarizes the process of attribute selection and reduction.

In the final step of data preprocessing, TID was separated into "Integrity" and "Not Integrity" group and only "Not Integrity" group was presented to AR. The reason is to investigate the weakest trait of integrity that reflects teachers' performance. Besides, it can concentrate into one group and this step can eliminate longer mining time as well as reducing the number of knowledge generated.

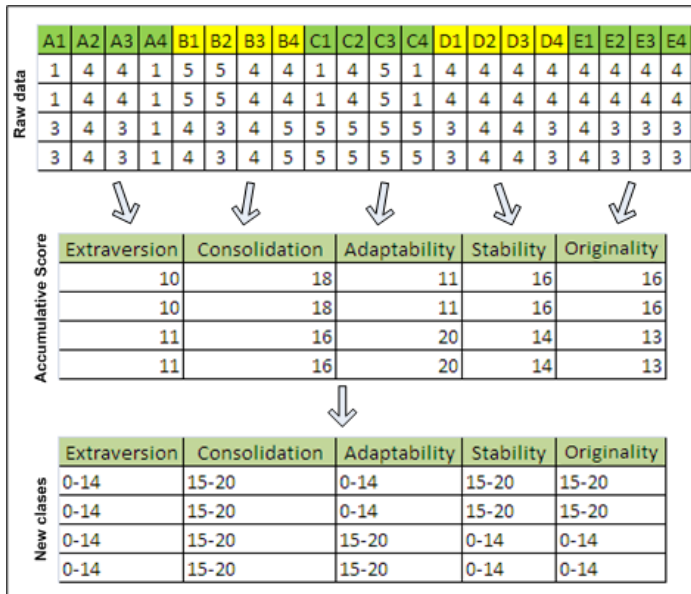


Fig. 3. Model development of the study

After the pre-processed, there were 454 remained records out of 1500 and 10 attributes. The attributes were gender, age, position, grade, department, stability, extraversion, originality, accommodation, and consolidation. Table 4 shows the statistic of "Not Integrity" group based on gender.

TABLE 4  
THE STATISTIC OF NOT INTEGRITY GROUP BASED ON GENDER READY FOR MINING

Gender		Total
Male	Female	
151	303	454

### 3.3 Integrity Traits Extraction

In pattern extraction, AR algorithm called apriori in WEKA data analysis tool was chosen as pattern extraction tool [7]. The clean TID dataset was presented to apriori algorithm and during mining, the length of frequent item set, support, and confidence value of each item set were recorded. In this study, the minimum support value was set to 10% while confidence value was limited to upper than 95%. Besides that, the maximum number of rule was limited up to 1000. The knowledge extracted from apriori was represented in term of frequent teacher's integrity trait matching. Then, the rules were further

analyzed to finalize the interesting matching among integrity trait. The next section will discuss the finding of this study.

## 4 FINDING

This section reports the finding of this work. After mining with apriori, there were 1000 rules generated and the algorithm also had generated interesting integrity trait with the maximum combination length is 7. Fig. 4 shows the number of interesting trait combination ( $f\_Char$ ) towards frequent item set length.  $L_n$  is representing the length and  $n$  is the number of attribute combination. For example, if  $L_4$ , there are four attributes combination. From Fig. 4, the highest  $f\_Char$  was generated in  $L_4$  and it was followed by  $L_3$ . The number of  $f\_Char$  is getting lesser when length increases.

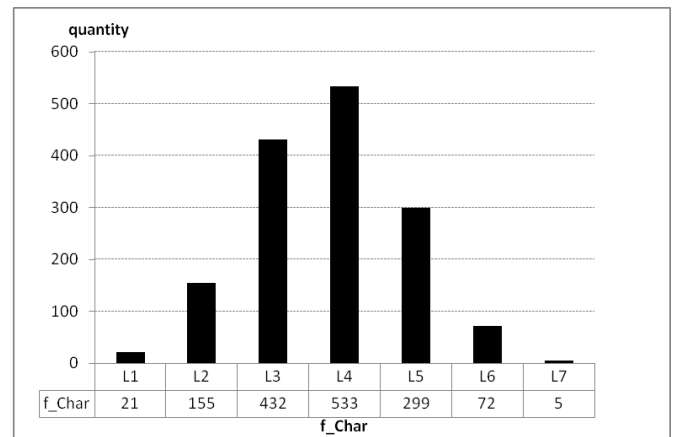


Fig. 4. The number of  $f\_Char$  according to  $L_n$

The results were further analyzed. We continued our analysis on the  $f\_Char$  by focusing at  $L_4$  until  $L_7$ . The  $L_1$ - $L_3$  groups were ignored since the trait is too compact and short. This exploration was divided into two parts. Firstly, is to investigate the demographic trait and secondly, is to investigate the integrity criteria trait. Table 5 and 6 depict the sample of  $f\_Char$  when the number of integrity trait combination is 4. S% in both tables is the support value.

TABLE 5  
THE SAMPLE OF  $F\_CHAR$  WHEN THE MAKSIMUM TRAIT MATCHING LENGTH IS  $L=4$

$f\_Char (L_4)$	Length	S%
Adaptability, Stability, Originality	3	7
Extraversion, Adaptability, Stability	3	4
Extraversion, Adaptability, Originality	3	4
Consolidation, Adaptability, Stability	3	6
Consolidation, Stability, Originality	3	4
Extraversion, Adaptability, Stability	3	4
Extraversion, Consolidation, Stability	3	3
Extraversion, Consolidation, Adaptability	3	3
Extraversion, Consolidation, Adaptability, Stability	4	1
Extraversion, Adaptability, Stability, Originality	4	1
Extraversion, Consolidation, Stability, Originality	4	1
Extraversion, Consolidation, Adaptability, Stability	4	1

**TABLE 6**  
THE SAMPLE OF F\_CHAR WHEN THE MAKSIMUM TRAIT MATCHING LENGTH IS L=5

<i>f_Char (L<sub>5</sub>)</i>	Length	S%
Adaptability, Stability, Originality	3	4
Extraversion, Adaptability, Originality	3	
Consolidation, Adaptability, Stability	3	6
Consolidation, Stability, Originality	3	
Extraversion, Adaptability, Stability	3	2
Extraversion, Consolidation, Stability	3	2
Extraversion, Consolidation, Adaptability	3	2
Extraversion, Consolidation, Adaptability, Stability	4	
Extraversion, Adaptability, Consolidation, Originality	4	3
Extraversion, Consolidation, Adaptability, Stability, Originality	5	1

Under demographic analysis, we found that the type of gender is not an important trait to determine the integrity level of teachers. Eventhough the gender attribute had appeared 55.08% in L<sub>4</sub>, both sexes have similar probability to behave with low integrity. Moreover, the study also found that the age group within "26-30" was the highest contributor in all *f\_Char* and interestingly, most of them were female. The figure in Table 7 indicates the number of *f\_Char* according to age group. Then, the salary grade and position were found not as a strong trait to determine integrity.

**TABLE 7**  
THE NUMER OF F\_CHAR ACCORDING TO AGE

Age	<i>f_Char length</i>						
	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>	L <sub>6</sub>	L <sub>7</sub>
20-25	63	4	2	0	0	0	0
26-30	150	16	46	58	31	3	0
31-35	85	5	4	0	0	0	0
36-40	75	5	4	0	0	0	0
41-45	0	0	0	0	0	0	0
46-50	0	0	0	0	0	0	0

Under integrity traits, we concentrated our analysis at the weakest score of integrity. The *f\_Char* were scanned and all five integrity traits with the weakest score "0-15" were marked as shown in Tables 5 and 6 in bold. The result of the scanning process is depicted in Table 8.

From Table 8, it can be seen that adaptability is the weakest integrity trait among teachers. In all n, adaptability has the highest score which indicates most teacher are lacking at the adaptability aspect. This is closely followed by stability which also indicates less integrity among teachers. The score of other trait - extraversion, consolidation, and originality is considered low compared to adaptability and stability.

**TABLE 8**  
THE RESULT OF SCANNING PROCESS TOWARDS INTEGRITY SCORE "0-15" IN F\_CHAR

<i>f_Char</i>	E	C	A	S	O
L <sub>4</sub>	73	54	179	165	61
L <sub>5</sub>	26	18	145	106	24
L <sub>6</sub>	2	2	43	40	0
L <sub>7</sub>	0	0	4	0	0
Total	101	74	371	311	85

E- Extraversion C- Consolidation A- Adaptability S-Stability O-Originality

Further observation was performed on the combination of more than one trait. The observation reveals that adaptability and stability traits were frequently occurred together in all *f\_Char*. For example, in L<sub>4</sub>, there were 47 combinations of adaptability and stability and 37 were found in L<sub>5</sub>. While in L<sub>6</sub>, 10 combinations were recorded. This result indicates teacher who lack adaptability will also have problem related to stability. In addition, the combination of "stability and originality" and "adaptability and originality" was also high. As can be seen in L<sub>4</sub>, there are 23 combinations of "adaptability and originality". The explanation of this part is summarized in Table 9. It indicates the frequency of the weakest trait for two traits combination in L<sub>4</sub>, L<sub>5</sub> and L<sub>6</sub>.

**TABLE 9**  
THE FREQUENCY OF THE WEAKEST TRAIT FOR TWO TRAITS COMBINATION IN L<sub>4</sub>, L<sub>5</sub>, AND L<sub>6</sub>

L <sub>4</sub>					
	E	C	A	S	O
E		-	16	-	-
C	12		-	18	11
A	-	-		47	23
S	19	-	22		25
O	15	-	-	-	
L <sub>5</sub>					
E		5	9	8	5
C	15		-	-	-
A	6	-		34	9
S	11	-	-		15
O	-	-	-	-	
L <sub>6</sub>					
E		-	1	-	-
C			-	-	-
A	-	-		10	1
S	-	-			1
O	-	-	-	-	

E- Extraversion C- Consolidation A- Adaptability S-Stability O-Originality

For longer combination, association rule generated several interesting traits matching. However, the number of combination is small. Information summarized in Table 5 is the interesting trait generated in L<sub>4</sub> with the number of combination is three and four. From Table 5, adaptability and stability exist in all combinations. Besides that, extraversion is sent to be fre-

quently paired with consolidation traits. The result is tailored with the  $f\_Char$  in  $L_5$  as displayed in Table 6.

However, starting from  $L_6$ , there are no interesting traits matching found with the condition minimum trait combination more than 2. As displayed in Table 10, the  $f\_Char$  in  $L_5$  only generates interesting traits matching with maximum length  $L=2$ . Similar to  $L_7$ , no interesting combination found.

TABLE 10  
THE INTERESTING INTEGRITY TRAIT MATCHING GENERATED IN  $L_6$   
WITH THE MAXIMUM MATCHING COMBINATION IS TWO

$f\_Char (L_6)$	Length	S%
Extraversion	1	2
Consolidation	1	2
Adaptability	1	43
Stability	1	40
Adaptability, Stability	2	11
Adaptability, Originality	2	1
Stability, Originality	2	1
Extraversion, Adaptability	2	2

In the  $L_7$  which represents the longest attribute combination, apriori has produced 5 rules as illustrated in Table 11. Hence, only adaptability trait appears to be the weakest integrity trait among teacher. Female teachers from A grade group seem to have the least integrity based on this frequent item set.

TABLE 11  
THE LIST OF RULES GENERATED IN  $L_7$

$f\_Char (L_7)$	Length	S%
Gender =F Position=A Grade=B Depart=C Extraversion=16-20 Consolidation=16-20 <b>Adaptability=0-15</b>	7	47
Gender =F Position=A Grade=B Depart=C Extraversion=16-20 Consolidation=16-20 Originality=16-20	7	45
Gender =F Position=A Grade=B Depart=C Extraversion=16-20 <b>Adaptability=0-15</b> Originality=16-20	7	46
Gender =F Position=A Grade=B Depart=C Consolidation=16-20 <b>Adaptability=0-15</b> Originality=16-20	7	55
Position=A Grade=B Depart=C Extraversion=16-20 Consolidation=16-20 <b>Adaptability=0-15</b> Originality=16-20	7	55

In general, the results indicate that adaptability and stability are the weakest traits among teachers due to the frequency of both traits exit in  $f\_char$ . The other three characteristics also exist in  $f\_Char$  but due to their low occurrence, we decided to ignore them as weak integrity traits. According to literature; adaptability refers to the tendency of teacher to be compassionate and cooperative rather than suspicious and antagonistic towards others, while stability refers to the ability of teacher responding to stress, high work load and dealing with negative emotions. Since adaptability and stability are the weakest traits among teacher, the school management may organize

suitable trainings to improve both traits.

## 4 CONCLUSION

Association rule technique was used to discover the weakest integrity trait of teachers. Results showed that adaptability and stability are the weakest traits among the teachers. Findings from this study can be used to assist the school management in identifying integrity traits that are mostly lacking among teachers and proposes a suitable training program for them. In addition, the school management will be able to make a shortlist of candidate for training. School management can use this guideline to propose suitable training program for teachers to improve their integrity mainly on adaptability and stability.

## ACKNOWLEDGEMENT

This research work was fully supported by LEADS Grants of Universiti Utara Malaysia (UUM) under the Ministry of Higher Education of Malaysia.

## REFERENCES

- [1] K. Christensen, The Magazine of the Rotman School of Management, Fall 2009, pp. 16-20.
- [2] M. Dowding. *Northern Rivers Business Magazine*: Autumn 2011.
- [3] P.J. Howard, and J. M. Howard, "The Owner's Manual for Personality at Work". Austin, Texas: Bard Press, 2001.
- [4] L.M. Saulsman and A.C., Page. "The five-factor model and personality disorder empirical literature: A meta-analytic review". *Clinical Psychology Review* 23 (8): 1055-1085, 2004.
- [5] M.R. Barrick, and M.K. Mount. "The Big Five Personality Dimensions and Job Performance: A Meta-Analysis". *Personnel Psychology* 44: 1-26, 1991.
- [6] M.K. Mount and M. R. Barrick, "Five reasons why the "Big Five" article has been frequently cited". *Personnel Psychology* 51: 849-857, 1998.
- [7] I.H., Wittenand and E., Frank. "Data Mining: Practical machine learning tools and techniques". Morgan Kaufmann: San Francisco, 2005.
- [9] Azam Ahmad. School teacher suspected rape 16 years old student. *The Star*, 2010. (online). [www.thestar.com](http://www.thestar.com) (5th July 2010)
- [10] Baker. J. Nobody's Perfect, But You Have To Be: The Power of Personal Integrity in Effective Preaching, New York: Mc Graw-Hill, 1990.
- [11] Kamarul Hassan. Guru Sekolah disyaki Merogol Pelajar Tingkatan 2. *Utusan Malaysia*, 2010. (Online) [www.utusan.com.my](http://www.utusan.com.my) (5th July 2010)
- [12] Popper, K. R. Objective Knowledge in higher educational systems processes. *Proceeding of 5th international conference*, University of Sydney, Australia. pp. 60-69, 1983.
- [13] Nillsen, R. The concept of Integrity in Teaching and Learning, Symposium on Promoting Academic Integrity, Newcastle NSW, 2004.
- [14] Thornton, M. Working with Integrity, Code Of Business Product, BhpBilidon, 2004. (Online) [www.bhpbilidon.com](http://www.bhpbilidon.com) (1st August 2010)
- [15] Nguyen, H.S., "Descrretization problem for rough set methods". In *Proc of First Int. Conf. on Rough Set and Current Trend in Computing*, 1998, pp. 545-552.

- [16] Daniel, N. "A test of character". The Guardian (London), 2009.
- [17] Starling, J.W. The effects of teacher stability on third grade student achievement as measured by the North Carolina End-of-Grade tests in reading and mathematics. Gardner-Webb University. Phd Thesis, 2009.
- [18] Agrawal, R. and Srikant, R.. "Fast algorithm for mining association rules.", Proc. Int. Conf. Very Large Databases, pp. 487-449, 1994.
- [19] Han, J. & Kamber, M.. Data mining concept and technique. San Francisco: Morgan Kaufmann Publishers, 2006.
- [20] Joan, M.R. Carrer Long Teacher Development: Policies that Make Sense. WestEd. 2006. (Online)  
[http://www.wested.org/online\\_pubs/teacher\\_dev/TeacherDev.pdf](http://www.wested.org/online_pubs/teacher_dev/TeacherDev.pdf) (15st August 2010)
- [21] Mohamad Mohsin, M.F., Md Norwawi, N, Hibadullah, C.F. & Abdul Wahab, M.H. An Investigation into Influence Factor of Student Programming Grade Using Association Rule Mining. International Journal of Advances in Information Sciences and Service Sciences. Vol 2, 2010.
- [22] Ma, Y., Liu, B., Wong, C.K., Yu, P.S., and Lee, S.M. "Targeting the Right Students Using Data Mining". In Proceedings of the Knowledge and Data Discovery (KDD2000), Boston, USA. Pp457-464, 2000.