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Stability of the Intrinsic Motivation Inventory (IMI) For the Use of Malaysian Form One Students in ICT Literacy Class

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The objective of the study is to determine the suitability of the Intrinsic Motivation Inventory (IMI) in assessing Malaysian form one students' intrinsic motivation gained through the tasks engagement in Information and Communication Technology (ICT) literacy class. 236 students completed the IMI in Bahasa Malaysia version. The reliability value of Cronbach Alpha for intrinsic motivation as a whole was .844. Cronbach Alpha values for the dimensions within IMI were in the range of .560 to .932. The two factors solution extracted from the factor analysis represented 66.85 percent of the total variance. All the dimensions in the initial IMI instrument were included in the two factors solution. Out of the 34 items, only item 13 was deemed to be unreliable as the factor loading generated was very low. The findings were further confirmed by using two incremental fit measurements, Tucker-Lewis Index and Normed Fit Index, generating values of .985 and .994 respectively. Although there were a few limitations in the study, researchers are cautiously optimistic that the findings will be both valuable and applicable for the assessment of intrinsic motivation gain through the ICT literacy class among Malaysian form one students.

Keywords: Abstraction, Conceptual Development, Conceptual Change

INTRODUCTION

Information and communication technology (ICT), is defined as a combination of informatics technology with other related technologies, specifically communication technology (Anderson & Weert, 2002). ICT is considered as a powerful tool to increase the nation's productivity, efficiency and diffusion of the latest information (Anderson & Weert, 2002; Atkinson, 2007; Government Information Office, 2009; Malaysia Prime Minister Department, 2008; Tripathi, 2006). ICT has becomes one of the basic building blocks of modern society in a very short time (Anderson & Weert, 2002). Thus, many countries regard the understanding of ICT and mastering of the basic skills and concepts of ICT as one of the core parts in education, besides reading, writing and numeracy. The critical need of ICT literacy has also been stressed by Arnold, Padilla, and Tunhikorn (2009). In line with current international trends, Malaysian Ministry of Education has taken a significant step to expose and widen the ICT skills and concepts to students through the introduction of ICT literacy class in Malaysian secondary school beginning 2007 (Curriculum Development Centre, 2007). Besides that, ICT literacy class is also a step in preparing students in line with the aspiration of Malaysian National Philosophy of Education as to generate a more holistic individual through education. The ICT literacy programme for secondary school emphasizes on the integration of knowledge, skills and values. The

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State of the literature

- The level of intrinsic motivation experienced by students indicated the interest and enjoyment while engaging in a specific task. This may lead to better persistency among students and facilitates learning process in long term.
- Intrinsic motivation instrument (IMI) established by Deci and Ryan has not been validated with the local population. Therefore, the use of IMI among Malaysians could be questionable as validity and reliability do not travel with the instrument.
- Given the importance of intrinsic motivation has towards the ICT literacy class, the stability of IMI for the use of Malaysian students is warranted as it will help teachers to further improve their pedagogical approach, learning contents and activities.

Contribution of this paper to the literature

- This study generated two factors for IMI. The first factor consists of interest/enjoyment, effort/importance, perceived choice, and value/usefulness dimensions. The second factor is in the form of negatively correlated between perceived competence and pressure/tension dimensions.
- Although previous researches shown that interest/enjoyment dimension predicted intrinsic motivation per se, this study indicated that the combination of interest/enjoyment, effort/importance, perceived choice, and value/usefulness dimensions could be better predictors of intrinsic motivation as a whole.
- Overall, the IMI is deemed to be valid, reliable and suitable for the use of Malaysian students.

knowledge to be acquired during the ICT literacy class consists of terminologies, concepts and facts about ICT. Meanwhile, the skills to be taught in the class include communication skills, information skills, managing computer system and problem-solving skills. From the aspect of values to be inculcated among the students, it involves responsibility, accountability, respect, cooperation, virtue and abide by ICT code of ethics (Curriculum Development Centre, 2007).

The guidelines prepared for the ICT literacy class were perfectly and well written by Curriculum Development Centre (2007). However, in an unpublished research done on 236 form one students, it was found that only six students or 2.5 percent of all the form one students being studied had fully attending all the ICT classes being held outside the school timetable (Eow, Wan Zah, Rosnaini, & Roselan, 2008). The percentage of students attending at least half of the classes being held was only 30.5 percent or 72 students. Meanwhile, 69.5 percent of students were attending once or twice or never at all. This was quite an alarming number as the ICT literacy classes conducted was considered as compulsory subject, that parallel with Malaysian Ministry of Education's significant step in exposing and widening the ICT skills to students (Curriculum Development Centre, 2007). Could it due to the teachers' material development incompetency as suggested by Varank (2009). Further research found that ICT learning environment did not provide the opportunities for students to be in control during the learning process (Wong, Lo, Ab Rahim, & Dietrich, 2009). Nevertheless, it had been described by Juuti, Lavonen, Aksela and Meisalo (2009) that nowadays, tool applications, databases, multimedia and social media application (Web 2.0) used in schools are quite similar to professional world. However, what do students personally feel about the whole programme? Do students really interested with the knowledge, skills and values imparted or to be imparted in the ICT literacy class? How do students perceive themselves with the ICT skills and knowledge obtained through the tasks done in ICT literacy class? Do students feel the value or the importance of the programme?

Therefore, there is a need to tap into students' intrinsic motivation gained through ICT literacy class as an indicator whether students do enjoying learning the subject in school and perceived themselves as better off than before. In real world, motivation is highly valued because of its consequences where it mobilizes others to act (Ryan & Deci, 2000a). The more the learning is intrinsically motivating, the more students will seek the knowledge for its own sake (Schweinle, Meyer, & Turner, 2006). Vansteenkiste, Simons, Lens Sheldon and Deci (2004) reasoned that when individuals learn for sake of intrinsically motivating purposes, there will be greater persistency and consequently, it facilitates learning process in long term.

According to the ICT literacy guideline prepared by Malaysian Curriculum Development Centre (2007), learning areas may be taught in any sequence according to students' ability, competency and progress. A class normally come with about 30 to 40 students. With students' different level of ICT competency and limited number of usable computers in each computer laboratory, can the objectives of ICT literacy programme be achieved? Students are expected to produce products based on learning outcomes independently and systematically. Therefore, each student needs a workable online computer. Can school fulfil this basic need? If this basic need is not even in par with the students' need, will students still intrinsically motivated by the whole event in ICT

literacy class? Intrinsic motivation gained by students is important in order to sustain students' active engagement in ICT literacy class. Without the sustainable active engagement, the three main objectives as listed by the Malaysian Curriculum Development Centre will not be accomplished. With these justifications, assessing students' intrinsic motivation acquired during the ICT literacy class is warranted for further improvement in the programme being implemented.

Given the importance of intrinsic motivation has towards the ICT literacy class conducted in school, this preliminary research conducted has devoted much attention into determining the stability of an intrinsic motivation instrument for the use of Malaysian form one students in assessing the their intrinsic motivation generated from the ICT literacy class. By assessing students' intrinsic motivation gained through the ICT literacy class, it will help teachers to further improve their pedagogical approach, learning contents and activities in order to suit students' preferences, as well as the computer and time evolution.

People are expected to be varied in the level of motivation(Ryan & Deci, 2000b). Ryan and Deci (2000b) described a motivated person as a person who is stimulated to do something. In another words, a motivated person will be energized or activated to engage in a task. Therefore, intrinsic motivation is described by both psychologists as moving to act because it is inherently interesting or enjoyable. Consequently, intrinsic motivation is worth being studied as both Ryan and Deci (2000a) further added that intrinsic motivation, deriving from within the person or from the activity itself, positively affects behaviour, performance, and well being. Besides that, intrinsic motivation assessment is important as it is an indication that an intrinsically motivated person will do a particular task voluntarily and persistently without the influence of any external reward (Vansteenkiste & Deci, 2003). Higher intrinsic motivation level also pointed out that a person is most likely experiencing interest and enjoyment while doing a specific task.

Enjoyment was conceptualized by Lindenberg (2001) as an emotion tied to improvement of one's condition. The more improvement generated, the higher the enjoyment. Lindenberg assumed that a person will be more likely to engage in an activity for any length of time without any tangible reward when the activity is more multifunctional. However, if a person is feeling incompetence, the ability to perform in a lengthy time will be reduced and so does the enjoyment of the activity. Meanwhile, Reiss (2004) cited that children show a need to feel competent and master their environments. It is deemed to be important in childhood development and in human behaviour generally. Providing opportunities to demonstrate skill is a support for competence among students (Schweinle et al., 2006). People are more likely to engage in activities that relevant social group's value when they feel competence in respect to the activities (Ryan & Deci, 2000b). At the same time, Ryan and Deci commented that people can also be intrinsically motivated because they themselves value an activity.

Students are using technology as a tool or a support for communication with others (Singh & Means, 2008). According to Singh and Means, this activity enables students to play an active role of recipients of information transmitted by a teacher, textbook, or broadcast, when students actively making choices about how to generate, obtain, manipulate, or display information. An end-product will be seen or produced from the process. While Singh and Means (2008) assumed technology as a tool to produce an end-product, Venkatesh (2000) had another point of view on the use of technology. Venkatesh believed that when people are more open to computer technologies, they are expected to indulge in using it for the sake of using it, rather than just for the specific outcomes associated with the use. Although Singh and Means (2008) and Venkatesh (2000) did not seem to have the same point of view on the use of technology, yet they seemed to agree to one point, that is the use of ICT does intrinsically motivated a person. By mastering the technology-based tasks, students will feel more competence and increase their awareness of the value placed upon technology as they are in the position of determining their goals, making decisions, and evaluating their progress (Singh & Means, 2008). Venkatesh (2000) commented that students will not hamper by the difficulty of the process of using computer technologies because they simply enjoy the process. Added to the enjoyment are the desire for fun, exploration, discovery, challenge and curiosity. Besides that, computer technology which enables a neat and attractive work presentation will provide the opportunity for students to take greater pride in the quality of their work (Theroux, 2004). Theroux believed that developing quality presentations can highly motivating students. Therefore, ICT does contribute to students' intrinsic motivation enhancement.

Generally, studies of intrinsic motivation have employed two different measurements of intrinsic motivation as a dependent variable (Vansteenkiste & Deci, 2003). Firstly, measurement is done through participants' free choice where they are free to either do more of the target activity or alternative activities. The second approach in assessing intrinsic motivation is through the use of self-report instruments such as Intrinsic Motivation Inventory (IMI), which is believed to be originated by Ryan (1982). Meanwhile, the improvement of the instrument has been credited to researches done by Ryan, Mims, and Koestner (1983);

Plant and Ryan (1985); Duda (1992); McAuley, Duncan and Tammen (1989); McAuley, Wraith, and Duncan (1991); Whitehead and Corbin (1991); Markland and Hardy (1997); and Deci, Koestner and Ryan (1999). According to Deci and Ryan (2007), IMI is intended to assess participants' subjective experience related to a target activity in term of interest/enjoyment, perceived competence, effort/importance, value/usefulness, felt pressure/tension, and perceived choice. According the Deci and Ryan (2007), although the overall questionnaire is called the Intrinsic Motivation Inventory (IMI), it is only the interest/enjoyment dimension that assesses intrinsic motivation, per se. Nevertheless, perceived competence, effort/importance, value/usefulness, and perceived choice constructs are theorized to be positive predictors while pressure/tension construct is the negative predictor of intrinsic motivation.

Researchers have tested the psychometric properties of IMI instrument with different populations of students (McAuley et al., 1989; Tsigilis & Theodosiou, 2003). Overall, their results generally demonstrated acceptable reliability and validity of the IMI with their respective populations and tasks. However, Ary, Jacobs, Razavieh and Sorensen (2006) argued that validity and reliability do not travel with the instrument. The instrument may be valid for the use with one population or setting but not another. In the meantime, IMI had also came under criticism by teachers in the study done by Berg, Bergeron, Monroe and McConnell (2007). They basically commented that the instrument was long and difficult for the use of elementary students and the negative and positive wordings on the IMI made the instrument difficult for young students. Creating instrument which is short enough to be accurately completed by young children and long enough to still be reliable is a problem that needs further investigation as suggested by the researchers. By considering the above discussions, as IMI has not been validated with the local population, the use of IMI among Malaysians could be questionable. Therefore, this study was done with the objective to determine the reliability, validity and suitability of the six dimensions and 34 items inclusion in IMI instrument for the use of Malaysian form one students in assessing intrinsic motivation gained through the engagement with the tasks in Information and Communication Technology (ICT) literacy class. Consequently, research question to be answered in this study was whether IMI instrument is reliable, valid and suitable for the use of Malaysian form one students in assessing their intrinsic motivation.

Procedure

This study was based on the analyses of data from a survey of form one students, from a school in the city of Kuala Lumpur, Malaysia. The school was selected as the students were with diverse academic performance and social economic status. Since the study involved form one students, the students' age range was between 13 and 14 year-old. However, only a portion of the survey data was reported in this paper pertaining to the purpose of this article. The survey was administered in

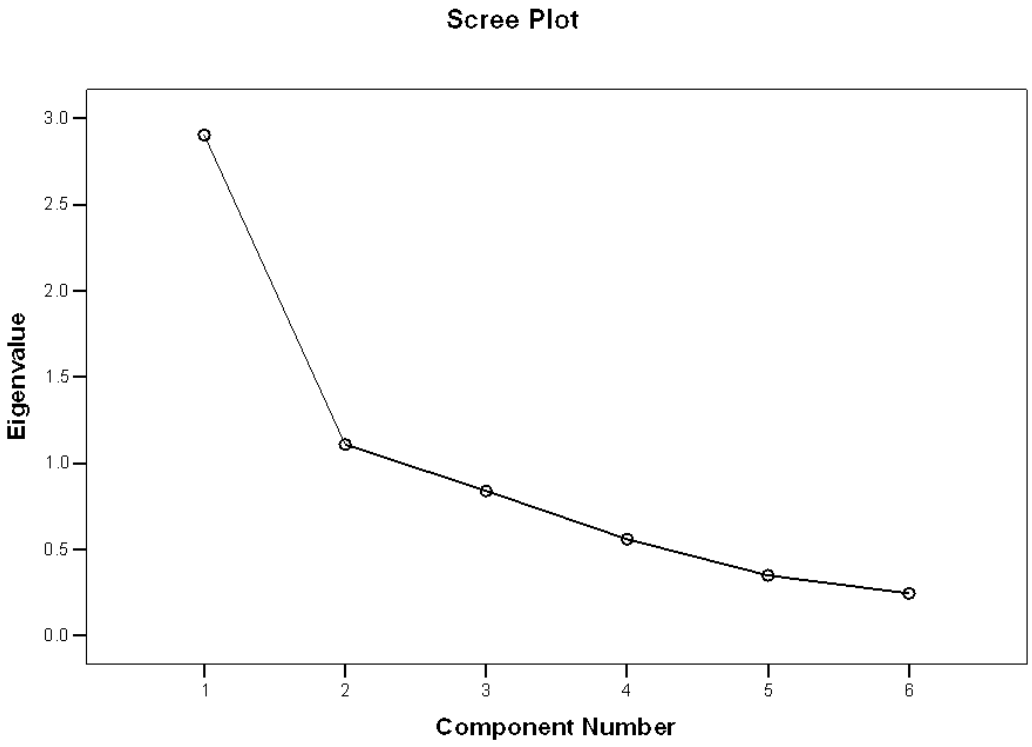

Figure 1. Scree test for component analysis

May 2008 and it was carried out in the students' respective classroom. As the main language of converse is Bahasa Malaysia, the questionnaire was translated into the language of Bahasa Malaysia. Translation was conducted using translation-back-translation procedures. The translator and back-translator were separate individuals. A researcher was present when the survey was carried out in order to help students understand the research's needs and items. A total of 236 form one students from classes A to H in the school completed the Intrinsic Motivation Inventory (IMI) questionnaire. About 12 students absented during the survey. Therefore, the findings were based on 95.2 percent of the form one students' population in that particular school which might have caused a slight limitation for any generalization to be made.

Items from original IMI were modified to pertain to ICT literacy class conducted in Malaysian lower secondary school. The inventory included the following dimensions: seven items for interest/enjoyment dimension; seven items for perceived competence dimension; five items for effort/importance dimension; five items for pressure/tension; seven items for perceived choice dimension; and four items for value/usefulness dimension. Items were rated on a 1 (Completely disagree) to 7 (Completely agree) scale.

The scores of each dimension in IMI were aggregated into an index measure of IMI index. Cronbach Alpha was used to determine the internal consistency of the questionnaires. Cronbach alphas for interest/enjoyment, perceived competence, effort/importance, pressure/tension, perceived choice and value/usefulness were .932, .603, .885, .560, .872 and .855 respectively. Meanwhile, the reliability value of Cronbach Alpha for intrinsic motivation as a whole was .844.

At stage one, the data collected was subjected to principal component factor analysis without rotation using SPSS 15.0 software as the analysis tool. The second stage of analysis involved data being processed using the analysis tool of LISREL, a Windows application for Structural Equation Modelling, for the purpose of confirmation of the previous analysis (Jöreskog & Sorbom, 2001).

FINDINGS AND DISCUSSION

Stage 1:

Objective of Factor Analysis

Factor analysis can identify the structure of a set of variables as well as provide a process for data reduction (Darlington, 2009; Hair, Black, Babin, Anderson, & Tatham, 2005). In this case, IMI which consists of six dimensions was examined to validate the instrument for the use of Malaysian form one students. In this study, the objective of applying factor analysis on the data was to determine the dimensions within the original IMI instrument that were appropriate in assessing intrinsic motivation gained among Malaysian form one students. By grouping the dimensions, researchers would be able to see the bigger picture of intrinsic motivation and what students think about the activities being carried out in ICT literacy class that can intrinsically motivate them.

Designing a Factor Analysis

R-type factor analysis and a correlation matrix between variables were being used to understand the structure of intrinsic motivation dimensions. Since all the dimensions were in metric type and constituted a homogeneous set of intrinsic motivation, it was appropriate for factor analysis. Regarding the adequacy of sample size, in this case, there was a 39:1 ratio of observations to dimensions which was more than enough. The sample size of 236 provided an adequate basis for the calculation of the correlations between dimensions.

Assumptions in Factor Analysis

Table 1 shows the correlation matrix for the six dimensions of intrinsic motivation. Inspection of the correlation matrix reveals that 12 of the 15 correlations (80 percent) were significant at .01 level of significance. Therefore, it provided a sufficient basis for proceeding to the next level, which was the empirical analysis of adequacy for factor analysis on both an overall basis and for each dimension.

The next step was to assess the overall significance of the correlation matrix with the Bartlett test of Sphericity. The correlations, when taken as overall analysis, were significant at the .0001 level (Table 1). In order to make the analysis more rigorous, another analysis was followed by using Measure of Sampling Adequacy (MSA). Table 2 shows that all the values of MSA were in the range of .646 to .868. These values fall above .50 and either exceeded or close to the .782 entry value of MSA.

By looking at Table 2, all the partial correlations were fairly low, with the highest partial correlation of –.476 between interest/enjoyment with effort/importance. These values indicated the fairly low strength of the interrelationships between the dimensions. Therefore, with the assurance of low interrelationships between the intrinsic motivation dimensions, the analysis could be preceded to the next stage.

Table 1. Correlations between intrinsic motivation dimensions to assess the appropriateness for factor analysis

Variable	Correlations among Variables					
	Interest and Enjoyment	Perceived Competence	Effort or Importance	Pressure or Tension	Perceived Choice	Value or Usefulness
Interest and Enjoyment	1.000	.277**	.732**	-.191**	.672**	.537**
Perceived Competence		1.000	.134*	-.213**	.096	.309**
Effort or Importance			1.000	-.113*	.644**	.467**
Pressure or Tension				1.000	.189**	-.170**
Perceived Choice					1.000	.394**
Value or Usefulness						1.000
** Indicates correlations significant at the .01 level.						
* Indicates correlations significant at the .05 level.						
Overall Measure of Sampling Adequacy: .782						
Bartlett Test of Sphericity: 477.344 df: 15 Significance: .000						

Table 2. Assessing the appropriateness of factor analysis through measures of sampling adequacy, and partial correlations between intrinsic motivation dimensions

Variable	Measures of Sampling Adequacy and Partial Correlations*					
	Interest and Enjoyment	Perceived Competence	Effort or Importance	Pressure or Tension	Perceived Choice	Value or Usefulness
Interest and Enjoyment	.752[a]					
Perceived Competence	-.206	.646[a]				
Effort or Importance	-.476	.087	.779[a]			
Pressure or Tension	.044	.164	-.063	.764[a]		
Perceived Choice	-.367	.123	-.289	.118	.811[a]	
Value or Usefulness	-.232	-.206	-.139	.050	-.032	.868[a]

* Diagonal values are measures of sampling adequacy for individual variables; off-diagonal values are anti-image correlations(negative partial correlations).

a. Indicates Measures of Sampling Adequacy (MSA) for each variable

Deriving Factors and Assessing Overall Fit

In deriving factors, the first step was to select the number of components to be retained for further analysis. Table 3 contains of information regarding the six possible factors and their relative explanatory power as expressed by their eigenvalues. Eigenvalues can be used to assist in selecting the number of factors (Hair et al., 2005). As eigenvalues was being used in selecting number of factor, two factors with the eigenvalues of 2.903 and 1.108 respectively as shown in Table 3 were retained in the study. To further support the decision made, scree test, which derived from plotting the latent roots against the number of factors extracted was generated. Figure 1 with the scree test generated indicated that the decision in choosing the two factors was appropriate and reasonable. Although Fabrigar, Wegener, MacCallum and Strahan (1999) were not very fond of the used of eigenvalues nor scree test, the researchers noted that it was appropriate to be applied to the eigenvalues of the full correlation matrix, which in this case, fitting the research being carried out.

By referring back to Table 3, it shows that one factor represented 48.38 percent of variance while two factors

Table 3. Results for the extraction of component factors

Factor	Eigenvalue	Percent of Variance	Cumulative Percent of Variance
1	2.903	48.383	48.383
2	1.108	18.462	66.845
3	.839	13.977	80.822
4	.558	9.306	90.128
5	.348	5.807	95.935
6	.244	4.065	100.000

Table 4. Unrotated component analysis factor matrix

Variable	Factors		Communality
	1	2	
Interest and Enjoyment	.895	.118	.814
Perceived Competence	.382	-.717	.660
Effort or Importance	.837	.301	.791
Pressure or Tension	-.326	.626	.499
Perceived Choice	.799	.277	.716
Value or Usefulness	.715	-.141	.531
			Total
Sum of squares (eigenvalue)	2.903	1.108	4.011
Percentage of trace*	48.383	18.462	66.845

*Trace = 6.0 (sum of eigenvalues)

Table 5. Unrotated component analysis factor matrix for split-sample

Variable	Factors		Communality
	1	2	
Split-Sample 1			
Interest and Enjoyment	.898	.131	.823
Perceived Competence	.455	-.671	.657
Effort or Importance	.801	.418	.817
Pressure or Tension	-.332	.687	.582
Perceived Choice	.781	.231	.664
Value or Usefulness	.749	-.132	.578
			Total
Sum of squares (eigenvalue)	2.937	1.184	4.121
Percentage of trace	48.954	24.232	68.688
Split-Sample 2			
Interest and Enjoyment	.888	.102	.799
Perceived Competence	.290	-.814	.746
Effort or Importance	.872	.135	.779
Pressure or Tension	-.292	.479	.315
Perceived Choice	.820	.336	.786
Value or Usefulness	.671	-.160	.475
			Total
Sum of squares (eigenvalue)	2.842	1.058	3.900
Percentage of trace	47.364	17.633	64.997

retained represented 66.85 percent of the variance of the six dimensions. According to Hair et al. (2005), in social sciences, a solution that accounts for 60 percent of the total variance is satisfactory. The index for the present solution shows that 66.85 percent of the total variance was represented by the information contained in the factor matrix of two-factor solution. Therefore, the

index derived from the analysis was higher than satisfactory.

Interpreting the Factors

The unrotated component analysis factor matrix in Table 4 provides the summary statistics detailing how well each dimension was explained by the two factors. The factors columns were the results of factor loadings of each dimension on each of the factors. As the sum of squares for factor 1 in Table 4 shows the value of 2.903 which was much higher than the second factor (1.108), it means factor 1 accounted for the most variance and factor 2 slightly less. The total amount of variance explained by the factor solution is 4.011. Since the analysis involved component analysis, the trace value was 6, which equal to the number of dimensions. Therefore, it accounted for 66.85 percent of variance in the analysis.

The value of communality in Table 4 helps in interpretation too as the size of communality is a useful index for assessing how much variance in a particular dimension was accounted for by the factor solution (Hair et al., 2005). The value of communality for each dimension ranged .531 to .814. Since the communality value for each dimension demonstrated was above the value of .50, it suggested that a large amount of the variance in the six dimensions has been accounted by the factor solution.

Based on the factor-loading pattern in Table 4, interpretation could be done in a quite straight-forward and meaningful way. Therefore, orthogonal (varimax) rotation was not needed in the study. In factor 1, interest/enjoyment; effort/importance; perceived choice and value/usefulness were grouped together based on the significant higher loadings. Meanwhile, in factor 2, there were two significant loadings with different sign. Thus, as perceived competence's level getting higher; pressure/tension will be lessening. All these dimensions are accounted for the assessment of intrinsic motivation as no dimension was deemed inappropriate to be dropped off from the instrument. It seemed that the first factor was indicating that when a person enjoyed or interested with a task given; and considered it as important or with significant value, he or she will put more effort into completing it and persist longer as it was his or her own choice. Meanwhile the second factor helped predicting that a task that caused pressure or tension to the participants would not help increase their intrinsic motivation as it would lowered the participants' perceived competency.

As pointed out by Hair et al. (2005) and Darlington (2009), the process of naming factors was based primarily on the subjective opinion of the researcher. Different researchers had the tendency to assign different names to the same results because of differences in their backgrounds and training. Therefore, in this study, researchers did not try to suggest any specific name for each of the factor extracted as the dimensions within each factor had been specifically named by its' inventor. As for this study, it was just the concern of inclusion of the dimensions for the assessment of intrinsic motivation among Malaysian form one students.

Validation of Factor Analysis on Intrinsic Motivation Instrument

Hair et al. (2005) suggested split sample analysis for validating the factor analysis done. The used of split sample analysis for validation had been applied by Nie and Lau (2009), Shah, Metz and Edlow (2009), Cho and Mostaghimi (2009), and Harzing et al. (2009), but in the very different area of studies. Therefore, in this study, the sample was randomly split into two equal sizes of 118 respondents each. The two groups were then reanalysed for the factor models to test for comparability. Table 5 contains the two factor models, along with the communalities. The two factor models were quite comparable in terms of both factor loadings and communalities for the six dimensions. Therefore, with these results, the researchers could be more assured that the results generated earlier were stable within the sample being studied.

Inclusion of items in the intrinsic motivation dimensions

The general criteria for inclusion of items on dimensions done by Deci and Ryan (2007) have been a factor loading of at least .60. However, Hair et al. (2005) indicated that factor loadings greater than +.30 are considered to meet the minimal level; loading of +.40 are considered more important; and if the loadings are +.50 or greater, they are considered practically significant. Appendix 1 is showing the results of analyses done on each dimension in order to determine the inclusion of items in the dimensions.

Based on Appendix 1, most of the items generated factor loadings of more than .60 except items number 13, 19, 20, 24 and 29. Nevertheless, items number 19, 20 and 24 with factor loading's range of .477 to .581 were still either considered important or practically significant. Therefore, the inclusion of these items was reasonable and appropriate. As for item 29, researchers suggested that the inclusion of this item to be considered according to situation. Item 29 which read "I did these activities in ICT class because I wanted to" did not meet the minimal level in factor loading. The analyses were done based on the ICT literacy class that students were required to participate without given any choices. Therefore, item 29 is worth considering for

inclusion when students are given a choice of participating in a particular activity. As for item 13, the factor loading was too small to be considered. Thus, researchers suggested item 13 to be dropped from the instrument. Yet, if item 13 is to be included, future research is recommended to use positive statement instead of negative statement for item 13 in order to test for its' stability across a variety of tasks, conditions, settings and samples.

Stage 2

Structural equation modelling (SEM) has the ability to assess the relationships comprehensively and provide a transition from exploratory to confirmatory analysis (DeCoster, 1998; Hair et al., 2005). The authors stated that in confirmatory factor analysis, researcher will have a complete control of the factor loadings, unlike in exploratory factor analysis where researchers have limited control over which dimensions are indicators of which latent construct. Therefore, on the second stage, through confirmatory factor analysis, researchers would have the ability to confirm the initial findings as SEM provides statistical test of goodness-of-fit for the proposed factor solution (Hair et al., 2005).

The initial principal component factor analysis outputs suggested the existence of two factors. The first factor consisted of interest/enjoyment, effort/importance, perceived choice and value/usefulness variables. Meanwhile, the second factor was characterized by perceived competence and pressure/tension variables. In SEM, these two factors are allowed to correlate (Hair et al., 2005). By referring back to Table 1, it shows that all the dimensions demonstrated some reasonable interrelationship between each other. With this assurance, it indicated that these dimensions were having some practical effects on the assessment of intrinsic motivation (Rummel, 2002). According to Rummel (2002), the patterns of interrelationship are not strange, since we continually deal with such notions in social theorizing. In fact, Ryan et al. (1983) conducted a principal component analysis on IMI and generated two factors that comprised of 26 items. The first factor comprised interest/enjoyment, and effort/importance. The second factor was related to pressure/tension. On the other hand, three factors emerged from the factor analysis carried out by Plant and Ryan (1985). These were interest/enjoyment, pressure/tension, and effort/importance. As a result, there could be possible statistical interpretation problems. Nevertheless, according to Fabrigar, Wegener, MacCallum and Strahan (1999), overfactoring (too many factor) is likely to lead to a solution where the major factors are well estimated by the obtained loadings although there might be additional poorly defined factors. However, underfactoring (too few factors) is likely to lead to a more serious problem of underestimated predictions.

As the main purpose was to confirm the initial results demonstrated through principal component factor analysis, LISREL analysis was used to generate the likelihood ratio chi-square statistic value. It was found that the likelihood ratio chi-square statistic value was 14.50 with four degrees of freedom, had a statistical significance level of .006. Therefore, the statistics indicated that the data was acceptable fit. Meanwhile the null model has a chi-square statistic value of 2615.70 with 15 degrees of freedom. With these information two incremental fit measures, the Tucker-Lewis Index and Normed Fit Index were calculated.

Tucker-Lewis Index (TLI):

$$TLI = (2615.70/15) - (14.50/4) (2615.70/15) - 1 = 0.985$$

Normed Fit Index (NFI):

$$NFI = (2615.70 - 14.50) 2615.70 = 0.994$$

Based on the above calculation of TLI and NFI, both incremental fit measures exceeded the recommended level of .90. Values of TLI and NLI ranged from 0 to 1 with a value close to 1.00 demonstrating a good measurement of fit (Brown & Cudeck, 1993; Byrne, 1998; Hair et al., 2005). As indicated by Darlington (2009), the main purpose of factor analysis is to discover simple patterns in the pattern of relationships among the variables and be explained largely or entirely in terms of a much smaller number of variables called factors. However, Evans and Rothbart (2009) commented that it is not realistic to assume that personality measures such as intrinsic motivation are likely to load on one and only one factor. Some additional factors, even if it appears to be insignificant in values, may contribute to the measurement of personalities concern. By referring back to the research question of the study, it seemed that the results of TLI and NFI calculations further support and confirm the acceptance of the two factors solution in the IMI instrument, which consist a total of six dimensions within in, as a valid, reliable and suitable for the use of Malaysian form one students.

CONCLUSION

Factor analysis assists in the construction of the summated scale (Darlington, 2009; Hair et al., 2005). However, it is noted that the approach to the interpretation of factor patterns is a matter of personal taste, communication, and long-run research strategy (Rummel, 2002). In this study, the two factor solution suggested that two summated scales should be constructed. Therefore, the first summated scale for intrinsic motivation will be calculated by adding interest/enjoyment, effort/importance, perceived choice, and value/usefulness dimensions. The second

summated scale was in the form of negatively correlated between the two dimensions of perceived competence and pressure/tension. As a result, both the dimensions are suggested to be analysed individually when assessing intrinsic motivation. Perceived competence is a positive predictor while pressure/tension is the negative predictor of intrinsic motivation. Previously, Deci and Ryan (2007) cited that interest/enjoyment dimension assesses intrinsic motivation per se in IMI instrument. But the data analyses done in this study indicated that the combination of interest/enjoyment, effort/importance, perceived choice, and value/usefulness dimensions could be better predictors of intrinsic motivation as a whole. Nevertheless, the factor loadings for interest/enjoyment dimension showed in Table 4 and Table 5, which were always the highest compared to the rest verified the consistency with what cited by Deci and Ryan (2007). As the conclusion, both our exploratory factor analysis and confirmatory analyses suggested that Bahasa Malaysia version of Intrinsic Motivation Inventory has the appropriate reliability, validity and suitability in assessing Malaysian form one students' intrinsic motivation gained in ICT literacy class. Nevertheless, caution is warranted as the study done only involved form one students in a particular school. With this limitation, the researchers recognize the extent to which our chosen methodology limits the scope, accuracy and generalization of the research conducted. Therefore, the researchers suggest other researchers to extent the study to a wider group of students and focusing on other tasks. However, the researchers are cautiously optimistic that the findings will be both valuable and applicable to the assessment of intrinsic motivation in ICT literacy class for Malaysian form one students.

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Appendix 1: Component analysis factor matrix for each dimension

No.	Items	Factor Loading	Communality
A.	**Interest and Enjoyment**		
1	I enjoyed doing the activities in ICT class very much.	.886	.784
2	The activities in ICT class were fun to do.	.891	.794
3	I thought activities in ICT class were boring. (R)*	.896	.803
4	The activities in ICT class did not hold my attention at all. (R)	.876	.767
5	I would describe the activities in ICT class as very interesting.	.868	.753
6	I thought the activities in ICT class were quite enjoyable.	.909	.826
7	While I was doing the activities in ICT class, I was thinking about how much I enjoyed it.	.904	.817
B.	**Perceived Competence**		
8	I think I am pretty good at the activities conducted in ICT class.	.773	.701
9	I think I did pretty well at the activities conducted in ICT class, compared to other students.	.737	.685
10	After working at the activities in ICT class for awhile, I felt pretty competent.	.730	.640
11	I am satisfied with my performance at the tasks in ICT class.	.671	.551
12	I was pretty skilled at the activities in ICT class.	.800	.645
13	These were the activities that I couldn't do very well. (R)	-.023	.684
C.	**Effort/Importance**		
14	I put a lot of effort into the activities conducted in ICT class.	.861	.741
15	I didn't try very hard to do well at the activities conducted in ICT class. (R)	.702	.493
16	I tried very hard on the activities conducted in ICT class.	.845	.714
17	It was important to me to do well at the tasks in ICT class.	.796	.633
18	I didn't put much energy into the activities conducted in ICT class. (R)	.668	.446
D.	**Pressure/Tension**		
19	I did not feel nervous at all while doing the activities in ICT class. (R)	.581	.762
20	I felt very tense while doing the activities conducted in ICT class.	.477	.575
21	I was very relaxed in doing the activities conducted in ICT class.	.603	.754
22	I was anxious while working on the tasks in ICT class.	.687	.567
23	I felt pressured while doing the activities in ICT class.	.724	.655
E.	**Perceived Choice**		
24	I believe I had some choice about doing the activities conducted in ICT class.	.575	.331
25	I felt like it was not my own choice to do the tasks in ICT class. (R)	.820	.672
26	I didn't really have a choice about doing the tasks given in ICT class. (R)	.770	.593
27	I felt like I had to do these. (R)	.904	.816
28	I did these activities in ICT class because I had no choice. (R)	.865	.749
29	I did these activities in ICT class because I wanted to.	.287	.082
30	I did these activities in ICT class because I had to. (R)	.868	.754
F.	**Value/Usefulness**		
31	I believe the activities in ICT could be of some value to me.	.908	.825
32	I would be willing to do these again because it has some value to me.	.903	.816
33	I believe doing these activities in ICT class could be beneficial to me.	.919	.845
34	I think activities conducted in ICT class are important activities.	.902	.814