

PEER LEARNING WITH CONCEPT CARTOONS ENHANCE CRITICAL THINKING AND PERFORMANCE IN SECONDARY SCHOOL ECONOMICS

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ABSTRACT

This study examined students' critical thinking and performance after implementing Peer Learning with Concept Cartoons (PLCC). A mixed method explanatory design with quantitative methods and a follow-up interview were employed in this study. ANOVA was used to analysis the quantitative finding. Before ANOVA was run, the normality test was employed. The conceptual framework in this paper was based on Vygotsky's Zone of Proximal Development. A total of 329 secondary school students from Malaysia participated in this study. The story line of the concept cartoons was created by the researcher which was consistent with multi-ethnic and informed by an understanding of Malaysian culture. The results revealed significant results on students' critical thinking and performance. The findings of the interviews also supported the quantitative analysis. This learning method should be explored in different ways or different subjects in future studies.

Keywords: Critical Thinking, Performance, Concept Cartoons, Peer Learning, Secondary School.

INTRODUCTION

Most of the education system focuses on developing students' higher-order thinking skills nowadays. (Stupple et al., 2017). It is accepted that every student can think naturally. However, without appropriate learning experiences, students often struggle to develop higher order skills in complex domains such as economic thinking. While economics is often regarded as a difficult subject, it is reasonable to expect that students' can apply economic principles to their daily lives. However, what does it mean to think like an economist? To think like an economist is the capacity to make a decisions, to be open to new evidence and the capacity to solve problems in daily life (Willingham, 2007). In short, it is the specific application of critical thinking to a problem area. However, the findings of Ferraro and Taylor (2005) indicate that economic students do not have deeper understanding of economics concepts or developed reasoning ability when compared to the science students. They also found that most economics classes only emphasize mathematical calculation and techniques to the detriment of economics reasoning ability. Malaysian graduates also face the same problem where their thinking ability is at a moderate level (Tarmizi et al. 2009). These findings imply that drastic and effective measures need to be taken at school level to prepare secondary school students to be effective employees who are able to think critically.

In addition, critical thinking is one of the important components of the secondary school economics syllabus. However, the majority of economics teachers still rely heavily on chalk and talk (Khoo, 2008) in their lessons. Without more sophisticated teaching and learning methods, it will be difficult to develop students' thinking skills.

Economics is an elective subject in form four (upper secondary, equivalent to year 10) in Malaysia. The Economics curriculum consists mainly of Mathematics, Graphing and working with formula. Students who take form four economics in secondary schools generally face difficulties in mastering economic skills that involve mathematical and graphing elements (Andreopoulos & Panayides, 2010). Many students found that the subject of Economics was difficult (Zakaria Kassim, 1993). This negative perception is one of the obstacles that further makes it difficult for students to perform well in this subject. Consequently, there is a detrition of the students that taking economics because they found that this subject is difficult to score. This phenomenon is supported by Khoo (2012).

Most Malaysian students rely solely on textbooks and memorization to score well in the examination (Khoo, 2008; Asikainen, Virtanen, Parpala, & Lindblom-Ylänne, 2013). Schools often encourage teachers to impart as much information as possible within the limited time allocated to them (Schaferman, 1991; Brevik, Fosse & Rødnes, 2014; Curdt-Christiansen, 2010). Researchers have suggested that teachers should conduct better teaching in economics especially when the students nowadays take this subject in order to develop critical thinking (Johnston, James, Lye & McDonald, 2000; Khoo, 2011). On the other hand, one of the major challenges of teaching economics is students need to have the knowledge and skills to adapt to the changing economic environment (Rogojanu, 2015). Furthermore, the majority of secondary school students are also the future university graduates in Malaysia. If most of the secondary students fail to think like economists, are they able to train future generations to think? Are they able to infuse the critical thinking in their lessons? Therefore critical thinking is an important element to be stressed in modern education, especially in higher education (Rajendran, 2004; Maria Saleh, 2010; Davies, & Lundholm, 2013; Dunne, 2015; Kwan & Wong, 2015; O'Hare & McGuinness, 2015; Shazaitul Azreen Rodzalan & Maisarah Mohamed Saat, 2015). Proper and systematic research needs to be carried out to identify the best ways for students to develop their understanding and knowledge beyond the surface level (Khoo, 2008; Bommel, Boshuizen & Kwakman, 2015; Williams, Venville & Gordon, 2013). In order to achieve this goal, researchers believe that the social interactions involved in group problem solving would enable students to extend their Zone of Proximal Development-ZPD (Vygotsky, 1997, Sopiah, 2005; Thurston et al. 2007). Peer interaction may promote learning to achieve ZPD compared to individual learning. Concept cartoons are one promising approach that has yielded positive results in terms of critical thinking and higher order thinking skills (Sengull, 2011). Furthermore, cartoons can support moral values which is in line with the current Economics curriculum. Two main aims in Malaysia are ethnic harmony, love and care society. Based on the moral value, an innovative instructional approach was developed that is referred to as Peer Learning with Concept Cartoons (PLCC) in this paper.

PURPOSE OF THE STUDY

This study applied the Peer Learning with Concept Cartoons (PLCC) approach to Economics education in order to investigate the utility of this method. In particular the

investigations carried out sought to examine students' critical thinking and learning performance. A follow-up interview after the interventions was carried out to examine their perceptions of this new method.

LITERATURE REVIEW

Benefit of Learning with Concept Cartoon

Concept cartoons are colourful, animated which are cartoon-style drawings showing different characters discussing everyday situations, are designed to provoke discussion and stimulate thinking (Webb, Williams & Meiring, 2008). Researchers found that concept cartoons help create a discussion environment in the classroom that can reveal student misconceptions (Kabapinar, 2005). Concept cartoons help students to see their misconceptions on the subject and help them develop new knowledge (Birisci, Metin & Karakas, 2010). For example, the first year economics students always confuse between the substitute effect and cost effect, a concept cartoon with different prices of goods will bring to a clearer picture. Concept cartoons help students experience different instructional methods other than the traditional lecture, looking at topics from different angles that help students see their misconceptions about topics and involve students more actively in learning (Birisci, Metin & Karakas, 2010). The students may involve interpreting the meaning of the concept cartoons during the collaborative learning.

With concept cartoons, students experience cognitive conflicts, apply theory and question their knowledge so as to resolve cognitive conflicts. Therefore, in this process, students actively use their inquiry learning skills while trying to validate their mental constructs and newly-acquired information (Evrekli, Inel & Balim, 2011). The concept cartoons can be used to promote group discussion which can enhance students' formation of ideas and critical thinking (Warren, 2001). Group discussion with the brainstorming activity is an essential part of critical thinking, it helps students to find the idea or solution to problem solving.

Akamca, Ellez & Hamurcu (2009) found learning through concept cartoons improved students' achievement. Cartoons increase both learning efficiency and students' understanding of content by engaging students in the study and remedying misconceptions. These approaches have a positive influence on the final performance of all students (Zhang, 2012). For example, the students can understand the concept of demand and supply through market activities. In addition, concept cartoons are a platform for students to discuss about their opposing viewpoints in a non-threatening environment, thereby fostering productive argumentation and discussion (Naylor, Keogh & Downing, 2007). The students also asked a variety of questions during the small-group talk and this directed the course of their discussion. Moreover, the implementation of the concept cartoon promoted students' learning interest (Zhang, 2012). Studies revealed that students in concluded that cartoons could be used as positive humorous instructional materials that make classrooms more enjoyable and score better performance (Sadowski & Gulgoz, 1994). Bhowon, Jhaumar-Laulleo, Wah & Ramasami (2014) indicated that use of concept cartoons had a positive impact on their conceptual understanding and performance.

Advantages of Peer Learning

Peer learning mainly refers to students' learning with and from each other as fellow learners without any implied authority from an individual (Boud, 2001). In this study, peer learning refers to a learning method where students learn through discussions with peers. A group

of researchers found that peer learning can develop deep learning (Scicluns, O'Sullivan, Boyle, Jones & McNel, 2015; Tsaushu et al., 2015). They also found deep learning can enhance critical thinking. Stenbag & Carlson (2015) found that student's feel safe when connected with their peers and this situation enhances their learning abilities.

The concept cartoons have provided students with the enjoyment of learning. It also created a conducive learning environment rich in both humor and fun (van Wyk, 2011). Concept cartoons have proven to be effective in increasing students' motivation (Bahrani & Soltani, 2011). Shurkin (2015) also believed that concept cartoons can enhance students' communication skills largely because of its novelty value in the classroom. The students can enhance their communication skills especially when they are working with their peers. Previous studies showed that peer learning is effective in the enhancement of students' confidence and learning (Dehghani, Amini, Kohuri & Nabeiei, 2014).

According to Ibrahim, Norlizah & Habibah (2015), peer learning can enhance students' academic performance. However, this group of researchers implemented online peer learning rather than the face-to face peer learning. Coetzee, Lim, Fox, Hartmann & Hearst (2015) also investigated how to introduce synchronous interactive peer learning online and reported positive findings. There is work that shows students can maximise their learning ability and improve their academic performance (Gulfo & Obsa, 2015).

CONCEPTUAL FRAMEWORK

The conceptual framework is based on Vygotsky's (1997) Zone of Proximal Development (ZPD) Theory. The ZPD is the difference between what students can achieve without assistance from others and what she or he can achieve with the guidance of facilitators or peers. Vygotsky (1997) believed that the ZPD is a powerful pedagogical space that can both accelerate and maximize learning. Peer learning and group work can contribute to the establishment of the ZPD. In this study, the first author developed an approach to learning with concept cartoons.

When the teachers conducted the lesson based on the developed approach, they had to introduce the main cartoon characters by laptop to the class during the induction set. This was followed by introducing the new economics concepts to the students before they had to discuss in peer groups using the given concept cartoons.

With the given cartoons, the students were allowed some time to discuss, develop the meaning of the concept cartoons and create the new ideas. During the discussion, the students could share their thoughts with teachers and peers. Social interaction among members is central to the students' acquisition of new knowledge and critical thinking skills (Vygotsky, 1997). The students also could enhance their interest in economics with the assistance of the concept cartoons. Concepts cartoons may help the students to understand the economics concept thoroughly and in a lively manner.

METHODOLOGY

Research Design

This study employed a mixed method explanatory design (Quan+qual). Quantitative analysis used Univariate Analysis of Variance (ANOVA) and interviews were employed in the qualitative method. Researchers did not inform samples they were in the research in order to control the Hawthorne effect. Even though this study was not an experimental research, in order to avoid human behaviours influences the social science study, Hawthorne effect has taken into consider.

Quantitative Samples

Participants from Form 4 secondary school students in Northern Malaysia (Kedah, Penang and Perak) formed the sample. In total 329 students were randomly selected from three schools from three different states.

Qualitative Subjects

After completing the intervention, five students from different schools were selected according to a purposive sampling technique. There were four females and only one male student. The purpose of the interview was to provide learners with an opportunity to share their experience after the intervention. The interview also provided information about how the intervention could be more useful and effective. An interview protocol was developed to guide these follow-up interviews.

Instruments

The research instruments comprised a 40 item performance test, the Cornell Critical Thinking Test Level X (Ennis, Millman & Tomko, 2005) and a set of semi structured interview questions. The performance assessment test was constructed by the researcher.

A pilot test was carried out to examine the validity and reliability of the instruments before deploying these to the actual research. Prior to the pilot study, the same syllabus was taught to the group of 40 students in a secondary school who were not going to participate in the formal group study.

Content validity of the questionnaire and the performance assessment were established by a team of lecturers in education. The reliability of the performance test was determined by Cronbach Alpha ($\alpha=0.718$). This was done by appointing two distinguished examiners to rate each item. Meanwhile the reliability of the questionnaire was estimated by calculating the Cronbach alpha coefficient ($\alpha=0.906$). These results are in line with standard benchmarks where an instrument with the coefficient of 0.70 or above can be considered reliable (Sekeran and Bougie, 2010).

Research Procedure

Teachers' and students' preparation for using concept cartoons began well before the implementation of the actual study. Preparation included managing the teachers' relevant skills

of the new teaching method and orienting students to the new learning environment. A different between PLCC with the traditional approach is Peer Learning Concept Cartoons (PLCC) is a new learning method that peer needs to discuss the concept cartoons by using tablets, understand them and write down the concepts after learning the economics concept; whereas traditional approach is only the face to face discussion without any assistance of the concept cartoons or other materials. PLCC can use it online or face to face.

The story line of the concept cartoons was created by the researcher which was consistent with multi-ethnic and informed by an understanding of Malaysian culture. Furthermore all the concept cartoons were created in line with the syllabus of secondary Form 4 economics and with practical economics application in mind. The concept cartoons have instilled the moral values such as love and care and ethnic harmony. The cartoons were drawn by a local young cartoonist and were created using Abdobe Premiere and Toonboom studio. A total of ten cartoon sets was created. Figure 1 showed three main characters in the cartoons were Mohammad, Ai Ling and Letchumi. Their names were using the acronym of MAL (acronym of Malaysia, M taken from Mohammad, A taken from Ai Ling and L taken from Letchumi).

CHARACTERS

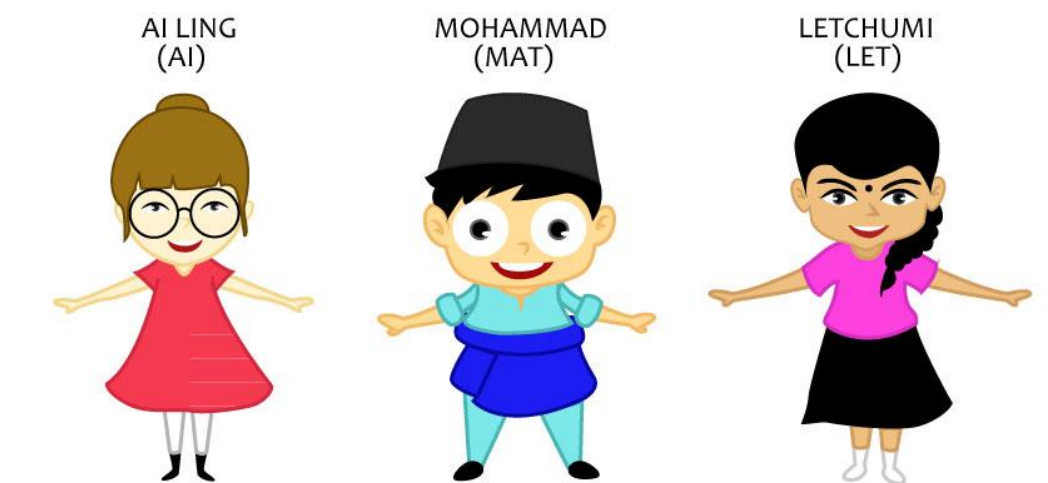


Figure 1
MAIN CHARACTERS OF THE CONCEPT CARTOONS

A briefing was given to teachers during the semester break at the end of March, 2015. A check list and the concept cartoons were distributed during the training session. Teachers could use the concept cartoons at the beginning of the lesson (induction set). In addition, teachers could also employ the concept cartoons during student's group discussion. Students were encouraged to discuss in groups of two and apply what they have learnt and students were searched materials

with tablets. A worksheet was distributed to the students to encourage active listening. The intervention took eight weeks to be completed. A critical thinking and performance test was administered to the students before and after the interventions. The survey questions were distributed to all the students.

A set of interview questions were constructed to address the qualitative aspects of the research questions. These semi-structured interviews were designed to elicit specific answers from the respondents. These interviews were carried out with five students. A follow up interview was conducted for clarity.

RESULTS

Analysis of Students' Critical Thinking and Performance

A preliminary analysis was conducted to check the prerequisite assumptions for ANOVA. This analysis showed the required normality of the data, homogeneity of variance for the DVs and covariate.

The assumption of linearity was supported by the Q-Q plots (Figures 2 and 3). All the data fell along the straight line showing that the dependent variables were normally distributed. A further investigation of normality was calculated by the skewness score with each dependent variable. The skewness score for the performance test was 0.850 and 0.276 for critical thinking. These values were acceptable because according to George and Mallery (2010) values for asymmetry between -2 and +2 are considered acceptable in order to prove a normal univariate distribution.

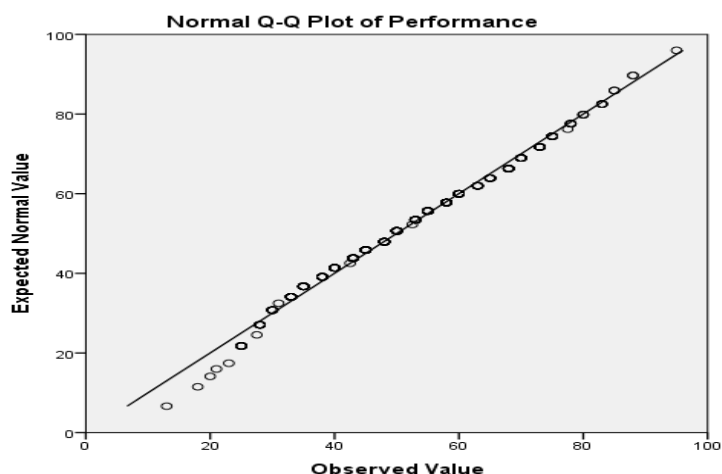


FIGURE 2
Q-Q PLOT FOR PERFORMANCE

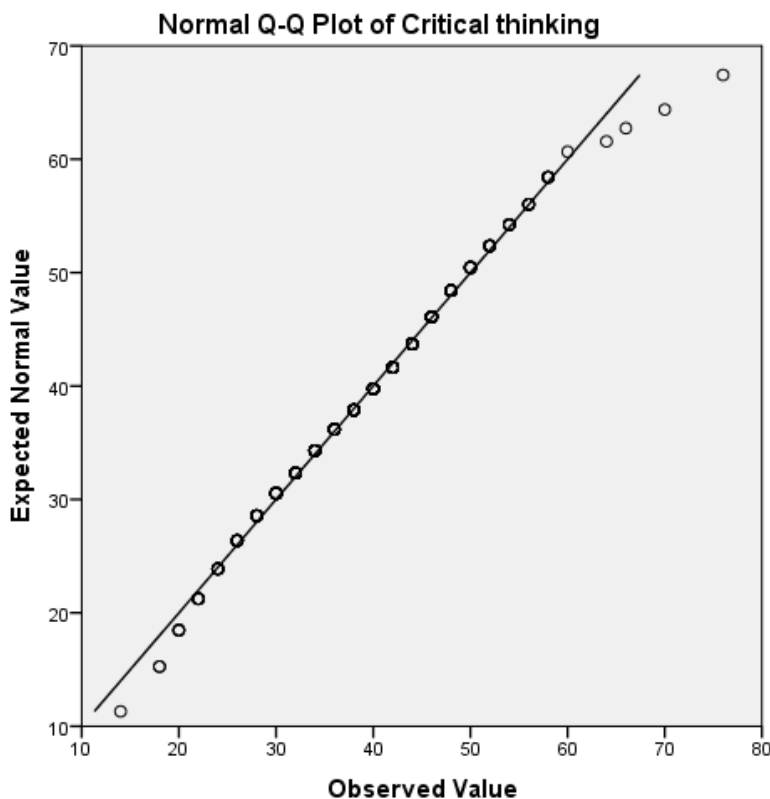


FIGURE 3
Q-Q PLOT FOR CRITICAL THINKING

A further KMO and Bartlett's test and factor analysis were conducted to examine the normality of the data. Factor analysis and principal components analysis explained the correlation matrix. Bartlett's Test is to address the assumption. The results from the KMO and Bartlett's Test showed 0.930 indicating sufficient items for each factor. This test was significant (less than 0.05) showing the correlations matrix is significantly different from an identity matrix, with correlations between variables being zero.

Levene's Test was conducted to test the assumptions of ANOVA whether each variant are equal across the group. The result of the Levene's Test for performance test showed $F_{(1,327)}=1.354$, ($p=0.245>0.05$) and for critical thinking $F_{(1,327)}=0.125$, ($p=0.724>0.05$). The Levene's Test for homogeneity of variance of each dependent variables showed that homogeneity of variance was met for the two dependent variables. The results from the Levene's Test indicated that the assumption of equal variance was met at the 0.05 alpha levels.

Testing of Hypothesis 1

H₀₁: There is no correlation between students' critical thinking and performance after they engaged with the PLCC.

Table 1 presents overall means, standard errors and standard deviations of each dependent variable by PLCC. The mean score for performance test was 51.33 (SD=15.43) whereas mean score for critical thinking was 39.37 (SD=9.7).

Dependent Variables		
Performance Test	Mean	51.33
	Standard Deviation	15.43
	Standard Error	0.85
Critical Thinking Test	Mean	39.37
	Standard Deviation	9.70
	Standard Error	0.53

Table 2 presents the outcome of the univariate ANOVA. The outcome of ANOVA indicated that there were significant differences between performance and critical thinking test after the students engaged with PLCC. The F ratio for intercept between performance and critical thinking was $F(1,26)=1043.725$ ($p=0.000$). This means that there was an effect after the students engaged with PLCC. Therefore, the H_{01} can be rejected.

ANOVA Effect	Univariate F	df	Significant
Corrected Model	F=0.852	df=1, 329	0.677
Intercept Performance and Critical Thinking	F=1043.725	df=1, 26	0.000*

*Significant at $p<0.05$

Table 3 represents the further investigation of the Pearson correlation between gender with students' critical thinking and performance after engaging with the PLCC. From the results, critical thinking and performance were correlated to gender significantly. In addition, critical thinking and performance were not highly correlated.

Variables	1	2	3	4	5
Gender	1				
Critical Thinking	*0.167	1			
Performance	*0.288		1		

*Significant at $p<0.05$

Feedback from Students' Interview

The first question posed to the students was how the concept cartoons helped them in their study. All the students agreed that concept cartoons were a very useful learning tool. Five of them gave very positive comments to using concept cartoons. Most of them agreed that concept cartoons can enhance their learning abilities through better understanding, enhance their thinking ability and help them remember the concepts easily.

Paragraph 1

G1: *"I can remember the formula and the concept easily when learning with this method."*

G4: *"My opinion is learning through cartoon can attract students' attention and make students more focus on the learning."*

B1: *"My view is PLCC can enhance our memory towards economics concept and good to use during the revision session too. Besides that, the cartoons make me think critically."*

Furthermore, the students also said that this learning method can promote their performance. Some of the participants expressed their views as follows,

G2: *"I did not like Economics last time because I was weak in this subject but after my teacher introduced this method to us, my result really goes up."*

B1: *"I feel sleepy when studying with the books but I find a lot of fun studying with cartoons and my results became excellent."*

DISCUSSION

Peer learning with concept cartoons was correlated with students' critical thinking and performance. Therefore, the H_{01} can be rejected. The findings of ANOVA for F ratio, intercept between performance and critical thinking was $F(1,26)=1043.725$ ($p=0.000$). This means that there was an effect after the students engaged with PLCC. Furthermore, the results showed that critical thinking and performance were correlated with the gender interaction being significant. Even though the effect of critical thinking was significant this was not obvious in the findings from the interviews. It is quite likely that students found it difficult to detect and assess changes in their thinking. Khalid, Meerah & Halim's (2010) work supports the results that cartoons are able to improve attitudes, increase productivity, creativity and divergent thinking. Some researchers (Sengul & Uner, 2010; Yuksel & Adiguzel, 2012) believed when students discussed with cartoons, they developed more original, creative and critical work. The findings from prior research found that students who engaged with PLCC have better the performance (Akamca, Ellez, Hamurcu, 2009; Zhang, 2012).

Prior research indicated that the use of concept cartoons had a positive impact on conceptual understanding and performance (Bhowon et al., 2014). Cho (2012) also showed similar findings indicating students can improve their performance by using cartoons. Quite clearly cartoon proved to be a valuable instructional tool for improving the quality of learning in a classroom (Cho, 2012; Ng & lai, 2012). The use of cartoons positively affected the perceived achievement levels (Sengul & Dereli, 2013). The findings showed that using concept cartoons in teaching not only improved critical thinking skills but also enhanced the students' learning interest and excitement (Birisci, Metin & Karakas, 2010). However, there are no significant findings for gender and concept cartoons in the literature.

FUTURE RESEARCH

These findings from the research that suggest further studies should be conducted to ascertain more conclusive results. Another area of future study might be considering the use of cartoons on mobile phones given that they have become a necessity for the new generation.

Future research should consider the value of developing a mobile application that employs cartoons to teach basic economics concepts. The integration of mobile technology into teaching and learning is expected to have great influence on the experience and performance of students (Mac Callum & Jeffrey, 2013; Mac Callum, Jeffrey & Kinshuk. (2014).

In addition, future studies could also focus on engaging students to draw their own cartoons based on what they have learned in the lesson. In the current studies, the data collection mostly focused on secondary school students. For future study, an extension of this model for undergraduates base on university syllabus could be fruitful.

CONCLUSION

This current study has developed some new insights. First of all, this study focused on concept cartoons with the moral value, Malaysian culture and current issues in line with secondary school Economics. Differing from previous studies, this set of concept cartoons were created based on part of Form 4 curriculum by a local cartoonist. The concept cartoons can be used in animated series with multimedia or in a static form in group discussion. This learning method should be explored in different ways or different subjects in future studies in order to make the lesson more engaging and educational. When the students enjoy the lesson, they are more attentive in class. Finally, it is a known fact that “a picture is worth a thousand words.” Even if the picture does not convey the full concept, cartoons can still help in making learning fun.

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