IMPACT OF SCORM FORMAT MATERIALS IN STYLES TO STUDENT'S LEARNING BEHAVIOUR CASE STUDY : INFORMATIC STUDENTS

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Abstract

The use of Internet technologies to enhance knowledge and performance is known as e-learning. MOODLE has become one of the popular learning platfom widely used. It also appears to be at least as effective as traditional instructor-led methods such as lectures. Existence of e-learning is not neccessarily as a replacement to traditional instructor-led training but as a complement to it, forming part of a blended-learning strategy. The lecturers play an important role to the success of the learning process in class, as moderator to the class instead of main learning source. Lecturers will no longer serve mainly as the distributors of content, but will become more involved as facilitators of learning and assessors of competency. Placing incorrect type of learning material to the course may result to unexpected end of learning process. A simple common way to do is to provide students with digital learning materials, and students are required only to download them, but lecturer will never know what next of student learning processes. This paper presents a case study of how selecting type of learning materials in SCORM format point toward the changing of students learning behaviour. How it allows learning to be individualized (adaptive learning), how to easily convert a commonly used Powerpoint file format to a new SCORM format material. Results of this study indicate that by using SCORM format material, lecturers will easily monitor students learning progress and higher level of students semester, the lower students' response to SCORM format of course material.

Keywords :e-learning, MOODLE, SCORM, student-behaviour

1. INTRODUCTION

In the recent years there is a shifting paradigm in learner behaviour. There are variety in ways of how students get involved in learning process, they are either to work in groups or to learn alone, and either to learn concrete material such as data and facts or abstract content like theories and their underlying meaning.

Individual differences of learners which also include their individual learning styles are the reason for this differences. Bajraktarevic, Hall, and Fullick (2003) , for example, Their study showed that students attending an online course that matches their preferred learning style (either sequential or global) achieved significantly better results than those who got delivered a course that did not match their learning style. In web-based learning systems, more attention is needed for incorporating learning styles and providing courses that fit to the students' individual learning style. INSPIRE by Papanikolaou, Grigoriadou (2003) , and TANGOW by Paredes, Rodríguez (2004) are an example on an adaptive system. While supporting adaptive features, they also have severe limitations. For example, adaptive systems lack integration, supporting only few functions of web-enhanced education, and the content of courses is not available for reuse , Brusilovsky (2004). On the other hand, learning management systems (LMS) such as Moodle, Blackboard, and WebCT provide a lot of simple features to administer and create courses. Graf S, List B (2005) said they have become very successful in e-education, but they provide very little or, in most cases, no adaptivity,. To obtain further data of students learning behaviour in LMS, analysis requires to be carried out about the behaviour of learners with respect to their learning styles. In this study, we investigate the behaviour of learners in an online course within Moodle and using format of SCORM material. Our investigations are based on the Kolb learning model as reviewed by Cassidy (2004), which is described in more detail in next section. Based on this model, we identified several patterns of behaviour (Section 3), which on the one hand seem to be relevant with respect to the learning style model and on the other hand are commonly used features in LMS.

2. METHODS

2.1 Kolb Learning Model

Although several learning style theories exist in the literature as shown on table 1., in this study we use Kolb learning style model (ELM/LSI) for it seems , to be the most appropriate for use in computer-based educational systems. Kuljis, Liu (2005), ELM/LSI describes the learning style of a learner in more detail, they are

Concrete Experience (CE), Abstract Conceptualization (AC), Active Experimentation (AE), and Reflective Observation (RO).

Table 1. Taxonomy of learning style models

Model	Curry (1987)				Riding and Cheema (1991)	Rayner and Riding (1997)		
	Instructional preference	Social interaction	Information processing	Cognitive personality	Wholist–analytic	Personality centred	Cognitive centred	Learning centred
Witkin (1962) Field-dependence/independence				●	●		●	
Kagan (1965) Impulsivity–reflexivity				●	●		●	
Holzman and Klein (1954) Leveller–sharpener				●	●		●	
Pask (1972) Holist–serialist				●	●		●	
Pavio (1971) Verbaliser–visualiser				●			●	
Gregorc (1982) Style delineator				●	●		●	
Kauffmann (1979) Assimilator–explorer				●	●		●	
Kirton (1994) Adaption–innovation				●	●		●	
Allinson and Hayes (1996) Intuition–analysis				●	●		●	
Kolb (1984) ELM			●					●

Those form four dimensions of learning which are prehension. It means grasping of inforation from experience and constituted by bipolar orientation CE and AC. The second dimension is transformation , which means processing the grasped information and constituted by AE – RO. Figure 2.1 shows detail of Kolb Learning Cycle.

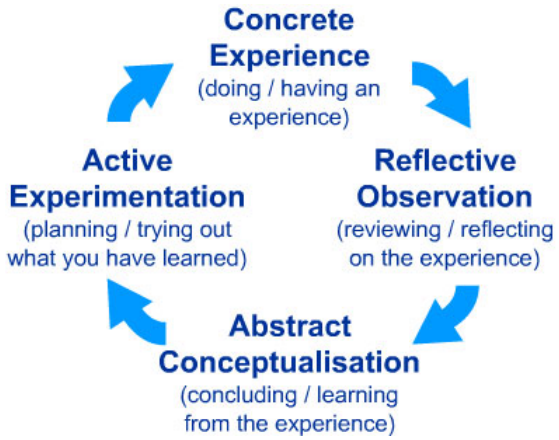

Figure 2.1. Kolb Learning Model

2.2 Design of Study

In this section, information about the design of the study is provided. Therefore, the course itself and its structure are described. We introduce SCORM as the instrument which was used for identifying learning styles. Moodle provides already quite comprehensive tracking mechanisms, some extensions were necessary in order to track all information that we aimed at investigating in our study. The study is based on the data from three laboratory courses which were taught at IBI Kwik Kian Gie, in even semester 2014/2015. The courses were divided into two parts, weeks before mid

semester and weeks after mid to end of semester . Data from the first part are considered as initial data and data from the second part as further data observation . Our investigations deal with the XML part of the course only. Each week consisted one SCORM material. The SCORM lesson material has various pages but the given time for each page is set to 60 seconds. This study was conducted in our learning management system named STYLES, Student Tutor and Your Learning Environment Services, at this address http://elearning.kwikkiangie.ac.id , as shown on figure 2.2 below.

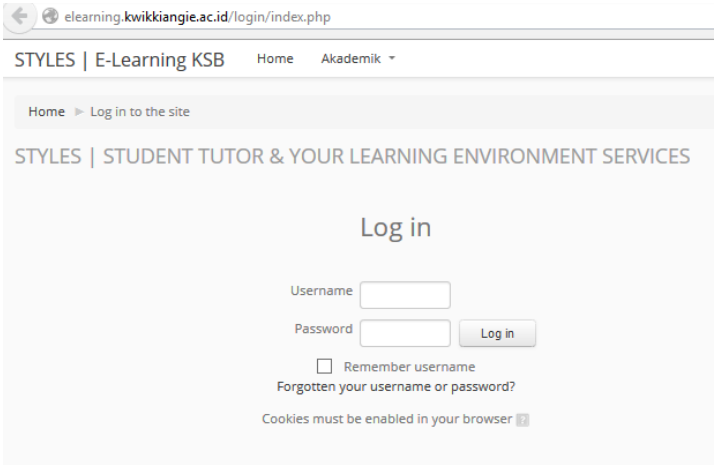

Figure 2.2 STYLES Learning Management System

To gain student learning behaviour, we emphasize the experience of the learners during their early time of using the SCORM materials until the end of semester.

2.3 SCORM

SCORM stands for "Sharable Content Object Reference Model". Its main aims are : 1) to enable developers to format and package learning content in a standardised way so that the content can be used on all LMSs and shared amongst other members of the learning and teaching community and 2) to enable delivery of the learning materials to the learner and tracking of learners' actions and scores (e.g. indicating when learners open a new page, complete a quiz, etc.) To date there have been two widely accepted versions of the SCORM: SCORM 1.2 and SCORM 2004. A new version is currently under development, and will be released by the end of 2008. (LETSI 2008)

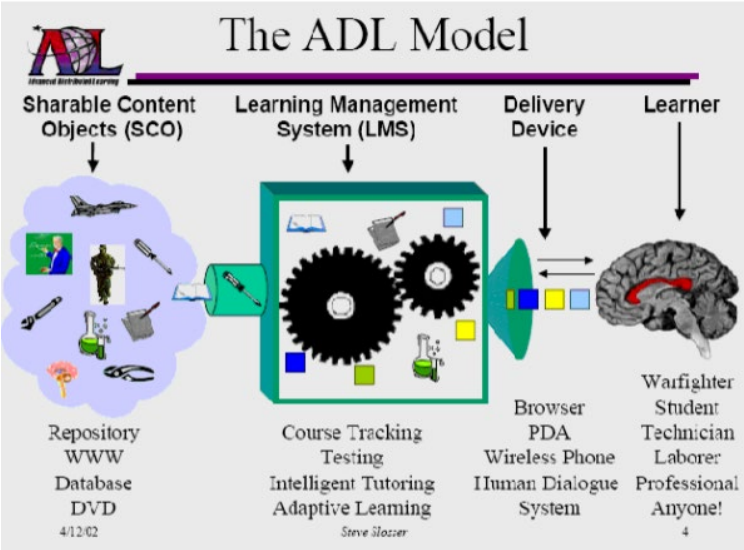

Figure 2.3. ADL Model

There has been a great deal of debate as to the definition of Sharable Content Objects (SCOs), which are sometimes interchangeably referred to as Learning Objects. (Dalziel 2003, Koohang and Harman 2006, McGreal 2004, Oliver 2001, Wiley 2000) Much of the debate has surrounded the concept of "granularity", or the extent to which a piece of a course can be removed from its context and used for other purposes. Figure 2.3 above shows ADL model originated from military way as reviewed by Friesen (2009).

The sequence of the processess is shown on figure 2.4, it starts with providing the weekly SCORM material to the course, then we configure two settings, availability and attempt management. The third step is to review the user logs and data obtained are analyzed in respect of student learning behaviour.

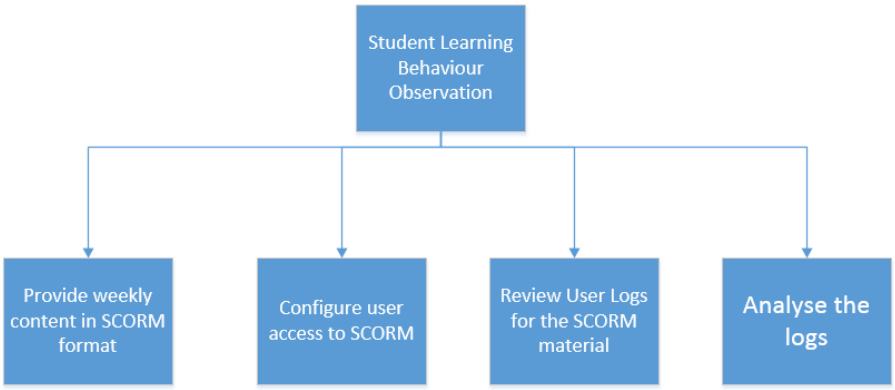

Figure 2.4 Observation of Student Learning Behaviour

2.4 Instrument for Collecting Learner Data

In order to investigate the behaviour of students during the course, their learning behaviour are needed to be identified. Therefore, we used data completion of each content and read repetition as our students behaviour. Moodle provides a number of different features to include in an online course. For our investigations and with respect to the above study design, only one of these features is of particular interest, namely SCORM.

In Moodle, learning material can be created by different types of learning objects, but for investigations regarding the learners' behaviour, the learning materials have to be in the form of SCORM. Since Moodle provides comprehensive tracking mechanisms, extension deals with the tracking of behaviour during students are performing SCORM. The standard measure to the SCORM is simpel as one page is set to 60 seconds, so if there are 20 pages, to be considered as normal all pages must be completed in at least 1200 seconds or equal to 20 minutes.

3. RESULTS

We investigated students learning behaviour of accessing the SCORM materials. 46 students from three courses participated in our study. Figure 3.1 shows sample data retrieved in early semester.

First name / Surname	Attempt	Started on	Last accessed on	Score
54120259 Andy Tristanto	1	Tuesday, 17 February 2015, 10:03 AM	Tuesday, 17 February 2015, 2:11 PM	100
56120316 Yovandi	1	Tuesday, 17 February 2015, 10:06 AM	Tuesday, 17 February 2015, 10:53 AM	100
56120154 Novryan	1	Tuesday, 17 February 2015, 10:04 AM	Tuesday, 17 February 2015, 10:56 AM	45.71
52120071 Handi Kurniawan	1	Tuesday, 17 February 2015, 10:03 AM	Tuesday, 24 March 2015, 11:19 AM	48.57
56120275 timothy tantama putra	1	Tuesday, 17 February 2015, 10:29 AM	Thursday, 26 March 2015, 11:42 AM	41.43
55120232 alfred adisurya	1	Tuesday, 17 February 2015, 10:03 AM	Tuesday, 17 February 2015, 1:02 PM	61.43
	2	Tuesday, 17 February 2015, 1:02 PM	Tuesday, 17 February 2015, 2:06 PM	30
53120160 Naufal	1	Tuesday, 17 February 2015, 10:03 AM	Tuesday, 17 February 2015, 10:52 AM	100
58120266 albertpandapotan	1	Tuesday, 17 February 2015, 10:04 AM	Tuesday, 17 February 2015, 10:04 AM	2.86
	2	Tuesday, 17 February 2015, 10:56 AM	Tuesday, 17 February 2015, 10:56 AM	52.86
57110258 Yogi Adi Gustiawan	1	Tuesday, 17 February 2015, 11:17 AM	Tuesday, 17 February 2015, 11:19 AM	11.43
Budi Berlinton Sitorus	1	Tuesday, 17 February 2015, 9:05 AM	Tuesday, 24 March 2015, 11:12 AM	100
55120166 Ricky Harianto	1	Tuesday, 17 February 2015, 10:45 AM	Tuesday, 17 February 2015, 10:56 AM	42.86

Figure 3.1 SCORM Users Logs

The material in figure 3.1 has 70 slides (figure 3.2), its time for accessing one slide is set to 60 seconds this means that to complete this material from the first slide to the last student must have at least 4200 seconds or equal to 70 minutes. From the example, the score indicates that the students had completed all slides. Instead of accessing the material once, two students accessed it twice. The first attempt of student 1 showed 61.43% and his second attempt showed only 30%, it indicated that in both of his attempt, he did not finish accessing the material, while the student 2 showed 2,86% for his first attempt and 52,86% for the second attempt. His both also was incomplete and indicated abnormal learning behaviour because he accessed both attempts only in one minute time.

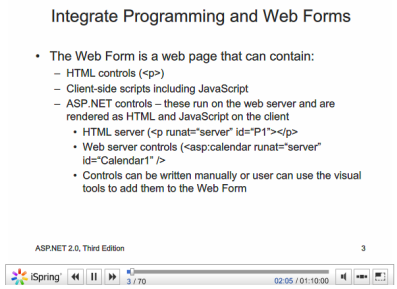

Figure 3.2 Course Material has 70 slides

Another instance of other week material from the same class is shown in figure 3.3 This logs was taken from the 7th week. This material contained 50 slides. Data from this log shows different situation, only student in class completed accessing the

material, while the rest of students in class did not complete reading the material. The first student's score was 58% and he did it within days from March 24th 2015 to May 28th 2015. The second student's score was 28% and completed in only six minutes. The 3rd student got 60% and completed it in eleven minutes. The 4th student complete material and finished it within three days between March 23rd in 9.41pm to March 26th 2015 8.30pm. Only one student in class indicated normal reading behaviour while the others showed various results.

	First name / Surname	Attempt	Started on	Last accessed on	Score	TM06
☐	54120259 Andy Tristanto	1	Tuesday, 24 March 2015, 9:59 AM	Thursday, 28 May 2015, 8:53 AM	58	58/100
☐	56120316 Yovandi	1	Tuesday, 24 March 2015, 11:21 AM	Tuesday, 24 March 2015, 11:27 AM	28	28/100
☐	56120154 Novryan	1	Tuesday, 24 March 2015, 10:06 AM	Tuesday, 24 March 2015, 10:17 AM	60	60/100
☐	52120071 Handi Kurniawan	1	Monday, 23 March 2015, 9:41 PM	Thursday, 26 March 2015, 8:30 PM	100	100/10
☐	56120275 timothy tantama putra	1	Tuesday, 24 March 2015, 1:33 PM	Thursday, 26 March 2015, 1:39 PM	8	8/100
☐	53120160 Naufal	1	Tuesday, 24 March 2015, 10:03 AM	Tuesday, 24 March 2015, 10:04 AM	8	8/100
☐	57110258 Yogi Adi Gustiawan	1	Tuesday, 24 March 2015, 11:25 AM	Tuesday, 24 March 2015, 11:30 AM	6	6/100

Figure 3.3 Another SCORM Logs From 7th week

There are two importants setting required for gathering data, they are availability and attempts management. To force students to read the material within the week, in this study, we set availability for the next week material right after the time of the course finish. Example of setting for availability and attempts management are shown in figure 3.4., figure 3.5 and figure 3.6.

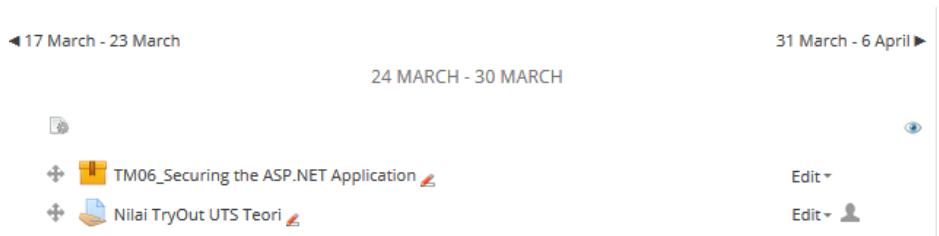

Figure 3.4 Active Week 24March – 30 March

In figure 8. above, the course material is for date March 24th to March 30th. To force student to read the specified material, the availability for the current week should be set within those time and the course material for the week after must be set before the next class begin as shown in figure9.

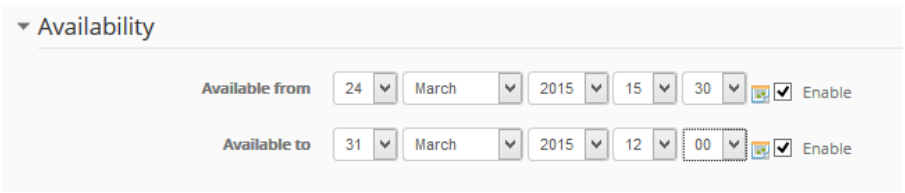

Figure 3.5 Availability setting for the course material

Other setting required to this SCORM for this study is attempts management. The setting is shown in figure 10. To give students fair time period for studying the material, number of attempts is left unlimited, and to get assessment for student learning activity, the score for the highest attempt is considered. To get more details of data, we force new attempt to student each time closing reading session.

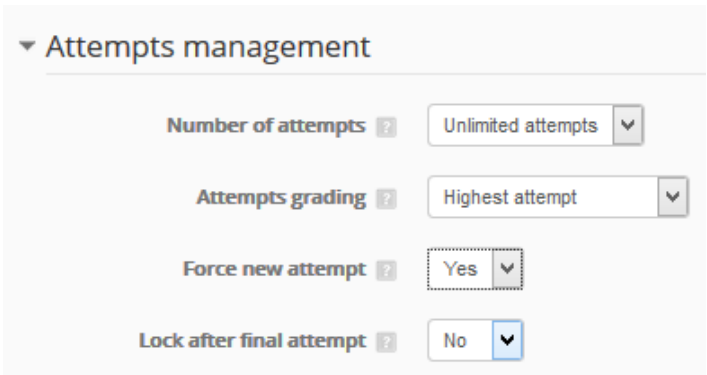

Figure 3.6 Attempts Management Setting

There are three classes involved in this study. Table 2 dan 3 show data score of the completed SCORM material viewed. Those tables included only the score each student obtained. Students of each course came from different semester level. Students in course A are 3rd level students, students in course B are 2nd level students and students in course C are 1st level students.

Table 2. Course A dan B Scores Data

		SCORE (%)									
	Student	1	2	3	4	5	6	7	8	9	AVG
COURSE A	1	17.8	48.6	24.3	46.7	80.5	100	98.2	42.3	40.6	55.4
	2	31.1	100	90.5	0	22	8	0	3.85	3.13	36.9
	3	0	100	33.8	46.7	0	58	81.8	80.8	75	68
	4	0	42.9	9.46	80	100	0	0	0	62.5	42.1
	5	0	61.4	35.1	4.44	0	0	14.6	-	0	28.9
	6	20	45.7	63.5	11.1	7.32	60	0	57.7	3.13	33.6
	7	97.8	41.4	66.2	55.6	2.44	8	34.6	100	100	56.2
	8	4.44	100	25.7	100	53.7	28	87.3	96.2	96.9	65.8
	9	22.2	11.4	0	15.6	0	6	0	0	0	13.8
	10	0	52.9	0	6.67	0	0	0	0	0	29.8
COURSE B	11	100	100	100	100	100	100	100	100	100	100
	12	0	100	100	56.8	100	100	100	100	100	94.6
	13	0	100	100	100	100	100	100	100	100	100
	14	0	100	100	100	0	0	0	0	0	100
	15	0	100	100	67.6	100	100	100	100	100	95.9
	16	38.5	100	100	62.2	100	100	100	100	100	89

Table 3. Course C Scores Data

		SCORE (%)									
	Student	1	2	3	4	5	6	7	8	9	AVG
COURSE C	17	100	0	11	18	100	0	100	100	100	57
	18	0	100	100	100	100	0	0	100	100	67
	19	100	100	100	100	100	100	100	100	100	100
	20	100	100	100	100	100	100	100	100	100	100
	21	100	56	100	100	100	0	0	0	0	91
	22	0	35	13	46	100	100	100	100	100	74
	23	100	15	15	100	100	38	38	38	38	54
	24	100	100	0	100	100	100	100	100	100	89
	25	100	100	100	100	100	0	0	0	0	100
	26	100	100	100	100	100	100	100	100	100	100
	27	100	100	0	100	100	77	100	82	87	83
	28	100	21	100	100	100	0	0	0	0	84
	29	100	100	100	100	100	100	100	100	100	100
	30	0	0	0	1.4	18	0	0	0	0	9.8
	31	100	100	100	100	100	100	100	100	100	100
	32	100	100	100	100	100	100	100	100	100	100
	33	0	0	0	0	9.1	100	100	100	100	82
	34	0	0	15	100	100	0	0	0	0	72
	35	100	100	100	100	100	0	0	0	0	56
	36	100	100	100	100	100	0	0	0	0	100
	37	100	67	53	23	100	54	100	100	100	77
	38	67	31	0	27	0	92	100	100	100	74
	39	-	15	38	0	0	0	0	0	0	27
	40	100	100	100	100	100	100	100	100	100	100
	41	100	100	100	100	100	100	100	100	100	100
	42	100	100	100	66	100	7.7	100	100	100	86
	43	100	100	100	100	100	100	100	100	100	100
	44	100	100	100	100	100	100	100	100	100	100
	45	100	100	100	28	12	100	100	100	100	82
	46	100	0	0	100	100	100	100	100	100	78

Data showed on those tables are logs from completion of SCORM material not to mention either they are normal or abnormal scores. To be classified as normal completion scores, some other data are required such as number of slides in each SCORM material, and time duration to complete reading the material. Data on table 2 and 3 shows that students of early level behave more active in SCORM material format compared to students in higher level.

4. CONCLUSION

In this section, we presented investigations about the behaviour of students in an online course within a learning management system, STYLES, with respect to SCORM material format. By analysing the behaviour of students based on reading completion scores, we found significant results indicating that weekly student learning process are

easily to be monitored by lecturers and students with different level also behave differently in completing SCORM course material instead of using a downloadable course material such as .pdf or .PPT format. These results can act as recommendation when aiming at providing courses in LMS that fit to learning behaviour of students. The results of our study provide information to facilitate the consideration of SCORM material format and students level in learning management systems. Future work will deal with using the gathered information as basis for providing interactivity and adaptivity of course material in LMS.

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