

(AEN Project 2005)

WG1: Interoperability technology of e-Learning

March.2006
e-Learning Consortium Japan

2 Implementation and support of WG activity (WG1: Interoperability technology of e-Learning, WG2: Validation system, etc.) in Asian e-Learning Network, hereinafter referred to as “AEN”)

2.1 Interoperability technology of e-Learning (AEN-WG1 activity)

2.1.1 Activity objective

In order to propagate e-Learning, it is necessary to maintain the environment that various types and volume of contents which users require, can be distributed into the market, and as the large premise, the interoperability between LMS and content must be kept. As a fundamental technology for the interoperability maintenance, the SCORM standard of ADL has been becoming international defacto standard, and this activity is performed to aim at propagation and promotion of the SCORM standard. Particularly in this year, surveillance and propagation activity regarding the SCORM 2004 standard which is a latest SCORM standard, is to implement as an important theme.

2.1.1.1 Objective

- (1) Surveillance and research of SCORM 2004 standard
- (2) Questionnaire surveillance of interoperability issue, etc. in field
- (3) Cooperation and information exchange with each AEN country and overseas standardization organization

2.1.1.2 Target result

- (1) Surveillance and research of SCORM 2004 standard

The SCORM 2004 standard is to survey, and the following documents shall be provided based upon the surveillance result.

- Preparation of SCORM 2004 guide
- Guide for SCORM 2004 content preparation
- Preparation of content case that SCORM2004 feature was used

- (2) Grasping and solution planning of interoperability problems being occurred in Japan and each AEN country
- (3) Tendency and status grasping of each AEN country and overseas standardization organization

2.1.2 Activity overview

2.1.2.1 Implementation system

Table 2-1 Implementation system

	Name	Enterprise, institute and university name
Leader	Kiyoshi Nakabayashi	NTT Resonant
Domestic member	Minoru Toida	SATT
	Mitsuru Ikeda	Japan Advanced Institute of Science And Technology
	Fumio Hirose	Wilson Learning Worldwide
	Hiroshi Miyauchi	Sangyo Notitsu University
	Shingo Shibata	Compaq
	Mamoru Ohta	Enegate
Overseas	Cambodia	MR.Sok Tha Ministry of Education, Youth and Sport
		MR.Om Sethy Ministry of Education, Youth and Sport
	China	MR.Ronghuri Huang Beijing Normal University
	Indonesia	MR.Robert Siagian Ministry of Finance, Directorate General of Budget Head of devition Region Bandung West-Java
	Korea	MR.Ju Hyung Lee Dunet Inc. CTO
	Laos	MS.Khampheng Phathadavong Sengsavanh College
	Malaysia	MR.David Asirvatham Centre for Multimedia Education Development, Multimedia University
	Myanmar	DR.Pyke Tin University of Computer Studies, Yangon Lecturer
	Philippine	DR.Rufino Mananghaya Philippine e learning Society
	Singapore	MR.Lim Kin Chew Learning Standards Technical Committee Chairman
	Viet Nam	MR.Lam Quang Nam Vietnam Information Technology Examination and Training Support Center Vice Director
	Thailand	DR.Niracharapha Thongdhamachart MICT
	USA	MS. Jennifer Brooks Alexandria ADL Co-Laboratory
Secretariat	Toshio Munemoto	e-learning Consortium, Japan
	Yoshiko Terada	e-learning Consortium, Japan

2.1.2.2 Schedule

Table 2-2 Schedule

Work item	April	May	June	July	August	September	October	November	December	January	February	March
<ul style="list-style-type: none"> • Planning • SCORM 2004 surveillance/research • Questionnaire surveillance • Cooperation with overseas standardization organization • International Conference • Activity summary 			▶									
										▶		
										▶		
									▲			
											▶	
												▶

2.1.2.3 Committee activity and others

(1) Domestic committee activity

Table 2-3 Committee activity

Conference name	Date held	Major agenda
First routine conference	Jul. 5, '05	<ul style="list-style-type: none"> • Planning and review of activity program
Second routine conference	Jul. 25, '05	<ul style="list-style-type: none"> • Preparation study of SCORM 2004 propagation promotion document • Preparation study of SCORM2004 application case
Third routine conference	Aug. 18, '05	<ul style="list-style-type: none"> • Study of interoperability questionnaire • Review of SCORM 2004 document preparation specification
Fourth routine conference	Sep. 16, '05	<ul style="list-style-type: none"> • English policy study of SCORM 2004 document • ADL business trip report
Fifth routine conference	Oct. 11, '05	<ul style="list-style-type: none"> • Review of SCORM 2004 document • Business trip report of SCORM International Community Conference (Australia)
Sixth routine conference	Nov. 8, '05	<ul style="list-style-type: none"> • Review of SCORM 2004 sample content • Agenda review of International Conference
Seventh routine conference	Dec. 2, '05	<ul style="list-style-type: none"> • Review of SCORM 2004 sample content • Study of International Conference presentation document
Eighth routine conference	Feb. 1, '06	<ul style="list-style-type: none"> • Review of SCORM 2004 document English version • Business trip report of ADL Taiwan Conference • Assignment of activity summary, report preparation, etc.

(2) International Conference activity

The first International Conference was held in Tokyo in December 14, 2005. The conference description is described in the sub-section 2.1.5.

2.1.3 Surveillance and research of SCORM 2004 standard

2.1.3.1 Overview

Concerning the latest SCORM 2004 standard, the following issues were found as the result of review from viewpoint of propagation and promotion.

- (a) The simple sequence function that is a feature of SCORM 2004 can prepare high content that was unable to prepare with SCORM 1.2, however there is difficult function to use.
- (b) The standard is too many volume to learn for a most of content developers.
- (c) The ADL standard is English version and is therefore not easy to use.

In order to therefore resolve such problems and to effectively propagate and to promote the standard, the following documents and samples were provided. Supply to each AEN country by English of documents, etc. provided this time and public release by AEN portal site and insertion to content presentation site are scheduled.

Table 2-4 SCORM2004 preparatin document list

	Preparation document	Preparation purpose (person concerned)
1	SCORM 2004 guide	Supplemental explanation of SCORM standard difficult section (for content developer of LMS and content)
2	SCORM 2004 content Preparation guide	Content should able to create without reading standard (for content developer)
3	Sample content	Supply of content development case(for content developer)

2.1.3.2 Preparation of SCORM 2004 standard

(1) Preparation policy

It's been several years since the SCORM (Sharable Content Object Reference Model) standard regarding WBT (Web-based Training) content had been practically used. During this period, many LMS (Learning Management System), contents and authoring tools complied with the SCORM standard were appeared in Japan and overseas, and had been widely used.

The standard that is being used is SCORM 1.2 released in 2000. The SCORM 1.2 has been used for many products, while insufficient function, vague standard, etc. have been pointed out. In order to resolve these problems, the specification newly released by ADL in 2004 is the SCORM 2004 that is explained by this booklet.

New functions such as sequencing and navigation have been added in SCORM

2004, and standard description has been detailed. Due to this, these have practically become almost satisfied contents, while whole standard page number exceeds 800, it is not easy to grasp all images from the standard.

Based on such statuses, the descriptions of all images of SCORM 2004 standard, newly added functions and differentiation with SCORM 1.2 were explained for personnel who has some knowledge regarding SCORM 1.2. The target is to promote for understanding the standard by reading the standard after reading this booklet.

(2) Contents

The following is the contents extracted from this booklet:

1. Preface
2. SCORM 2004 overview
 - 2.1 What is SCORM?
 - 2.2 History of SCORM standard
 - 2.3 LMS model
 - 2.4 SCORM 2004 overview
 - 2.5 SCORM standard transition (SCORM 1.2 from SCORM 1.0)
 - 2.6 Changed points from SCORM 1.2 to SCORM 2004
 - 2.7 Future SCORM
3. Sequencing
 - 3.1 Content construction and learning target
 - 3.2 Tracking information
 - 3.3 Navigation request, sequencing request and completion request
 - 3.4 Sequencing rule
 - 3.5 Attempt
4. Navigation
 - 4.1 Navigation control overview
 - 4.2 Navigation command send and SCO completion
 - 4.3 LMS navigation GUI control
5. RTE
 - 5.1 Overview of SCORM runtime environment
 - 5.2 Startup of learning source
 - 5.3 API
 - 5.4 Data model
6. Realization of sequencing
 - 6.1 Sequencing process
 - 6.2 Dummy code
7. Realization of runtime environment

- 7.1 Startup
- 7.2 Installation of API instance
- 7.3 Installation of data model
- 7.4 Correspondence with tracking information and RTE data model
- 7.5 Installation of navigation function
- 8. Transition from SCORM 1.2 to 2004
 - 8.1 Difference and transition of manifest file
 - 8.2 Difference and transition of RTE

2.1.3.3 Preparation of SCORM2004 content preparation guide

(1) Preparation policy

Most large feature of SCORM 2004 is that the standard regarding sequencing and navigation was newly added, in addition to content aggregation model and runtime environment. Due to this, the behavior of dynamic content corresponding to learning sequential planning and learning status of learner that was not able to describe in previous version became possible to control. Furthermore, the commands such as “Advance to next” and “Back to before” became possible to control at content side, and freedom of material design and development by content creator became high.

In addition, the content aggregation model and runtime environment such as improvement of interoperability, reduction of standard vagueness and correspondence to sequencing and navigation that were newly added, were also changed. Due to high performance function of such standards, the contents of SCORM 2004 standard are widely spread, in proportion to increase of possibility of content preparation and there are some issues that do not easily understand by the content creator.

In this booklet, subject to the content creators who have some knowledge of SCORM 1.2, practical explanation will be also made by mixing partial sample codes regarding overview and concept of SCORM 2004, points in content preparation and installation method of standards. Furthermore, The points to shift the SCORM 1.2 compliance contents to the SCORM 2004 contents will be also explained.

This booklet explains practical and useful information in order to understand SCORM 2004 more for mainly targeting the content creators, however it does not directly involve in content creation, and it will be explained as the guide that can be used for personnel who involve in planning, design and development of e-Learning.

(2) Description contents

The following is the contents of this booklet extracted. The description contents in sections 1 – 5 are the same as the SCORM 2004 guide.

1. Preface
2. SCORM 2004 overview
3. Sequencing
4. Navigation
5. RTE
6. Actual content of SCORM 2004
 - 6.1 Actual sequencing
 - 6.2 Actual 2004 SCO
7. Point of shift from SCORM 1.2 content to 2004 content
 - 7.1 Manifest file and SCO
 - 7.2 Shift of manifest file (imsmanifest.xml)
 - 7.3 Shift of SCO
 - 7.3.3 Change of data model
 - 7.4 Change of error code
 - 7.5 Possibility of SCORM 2004

2.1.3.4 Development of SCORM 2004 standard compatible sample content

(1) Preparation purpose

SCORM 2004 compared with SCORM 1.2 is succeeding version, however differentiation is occurring in a large portion. Since standard volume was extremely increased, it is very difficult status to understand SCORM 2004 by reading the standard from the beginning. As one of approach to understand SCORM 2004, the SCORM 2004 standard compatible sample contents were developed. By operating these contents, it has been contrived to be able to intuitively understand the operation of sequencing, etc. that was not able to realize in SCORM 1.2.

(2) Feature of SCORM 2004 that SCORM 1.2 does not have

Before the sample contents are created, an effort was made to create the contents that are unique SCORM 2004. Before creation, the following points of SCORM 2004 were re-checked.

(a) Content interchangeability is high

This was operational problem because SCORM 1.2 was separated into mandatory portion and option portion and existence of option had to always check in the case the content was loaded on LMS. Since all things were mandatory for SCORM 2004, the interchangeability was remarkably increased.

(b) Difference on control between SCO and LMS

As shown in the following figure, SCORM 1.2 was able to realize inherent logic inside SCO by stating the Javascript, etc. if the content creator intended to create an effective content. However, as the result, the interoperability will

disappear, and meaning as common possible part that is feature of SCO will be lost. Furthermore, since the logic was hidden behind SCO, maintenance and improvement were difficult.

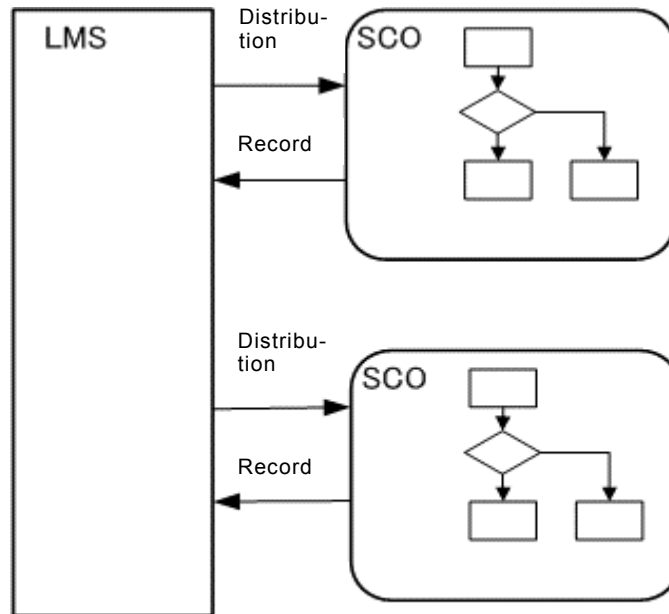


Figure 2-1 SCORM 1.2 construction

Contrastively, in SCORM 2004, logic has been written in XML of the Manifest file, and has been shifted in LMS. By doing so, the SCO interoperability is increased, resulting in expansion of usability as part. Furthermore, the logic can be seen from outside, resulting in easy maintenance and improvement. Sequence can be also described, resulting in becoming possible distribution request to LMS from SCO, and effective contents became possible to create.

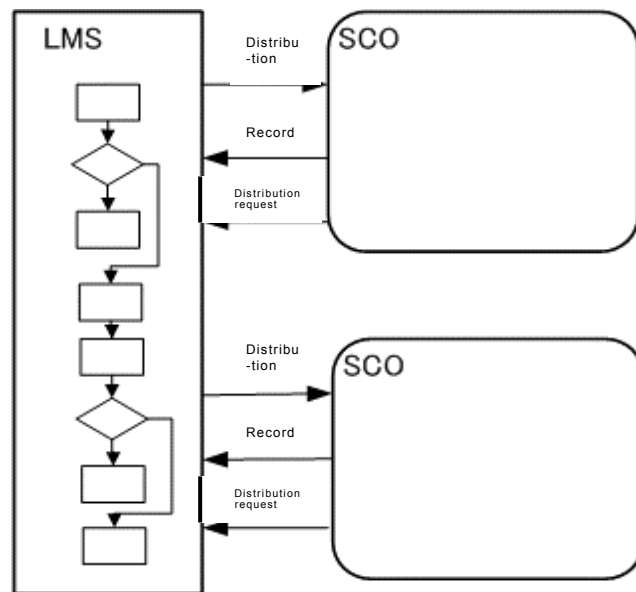


Figure 2-2 SCORM 2004 construction

The superiority of SCORM2004 was described in the above, SCORM 2004 sequence control is not always simple. Therefore, as template using several sequences, the method that content can be easily created, was considered. From such viewpoints, the following 3 types of template were concreted as sample contents.

(3) Sample content overview

3 types of SCORM 2004 standard compatible sample content were created.

The first one is the content package aiming at entrance examination measure of information processing engineer examination. This is the content to check learner's skill.

The following shows the features of this content package:

- Supplies learning quota corresponding to information processing ability of learner,
- Shall consecutively learn the activity,
- Can execute the skill check by each field,
- Executes comprehensive skill check by dummy examination, and
- Issues passing certificate in the case of passing of dummy examination.

The following shows the learning procedure of this content package:

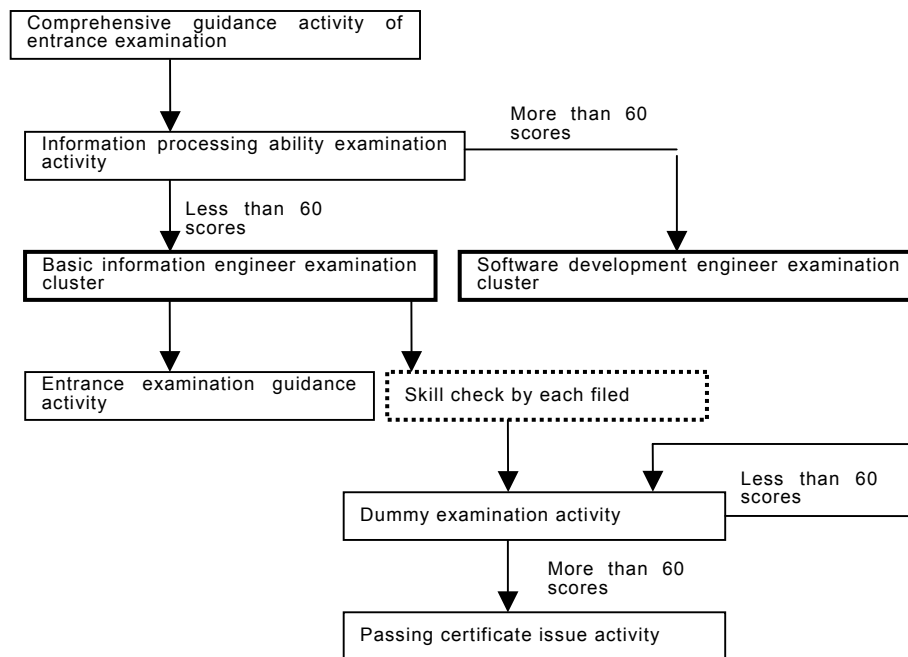


Figure 2-3 Learning procedure (information processing engineer skill check)

The target of this content is to make correction deficits of that even if learners who have different conventional skill answer all same questions, only very rough skill check can be done. At first, in order to grasp correct skill by classifying into more than and less than 60 scores and by letting them answer the questions corresponding to such skill, correct skill can be grasped as well as the examination time can be shortened without performing several examinations.

These sequence controls became possible to realize by first use of standard (tag) in SCORM 2004.

The second one is to be same subject of the entrance examiner of information processing engineer examination but is the content aiming at skill up of learners.

The following shows the features of this content:

- Supplies learning quota corresponding to the information processing ability of learners,
- The activity is mixed by consecutive learning and selective learning,
- Can execute the skill up by each field,
- The skill up cluster (unit) includes multiple activities, and consists of perusal type activities with n numbers and examination type activity with 1 number (unit end examination),
- When learner did not pass execution of first unit end examination, he reviews from first activity within the unit. Advance to the next without control in the

second execution.

- Provides activities that past questions were randomly prepared to aim at the skill up of learner, and
- Check the skill up by dummy examination.

The following shows the learning procedure of this content package:

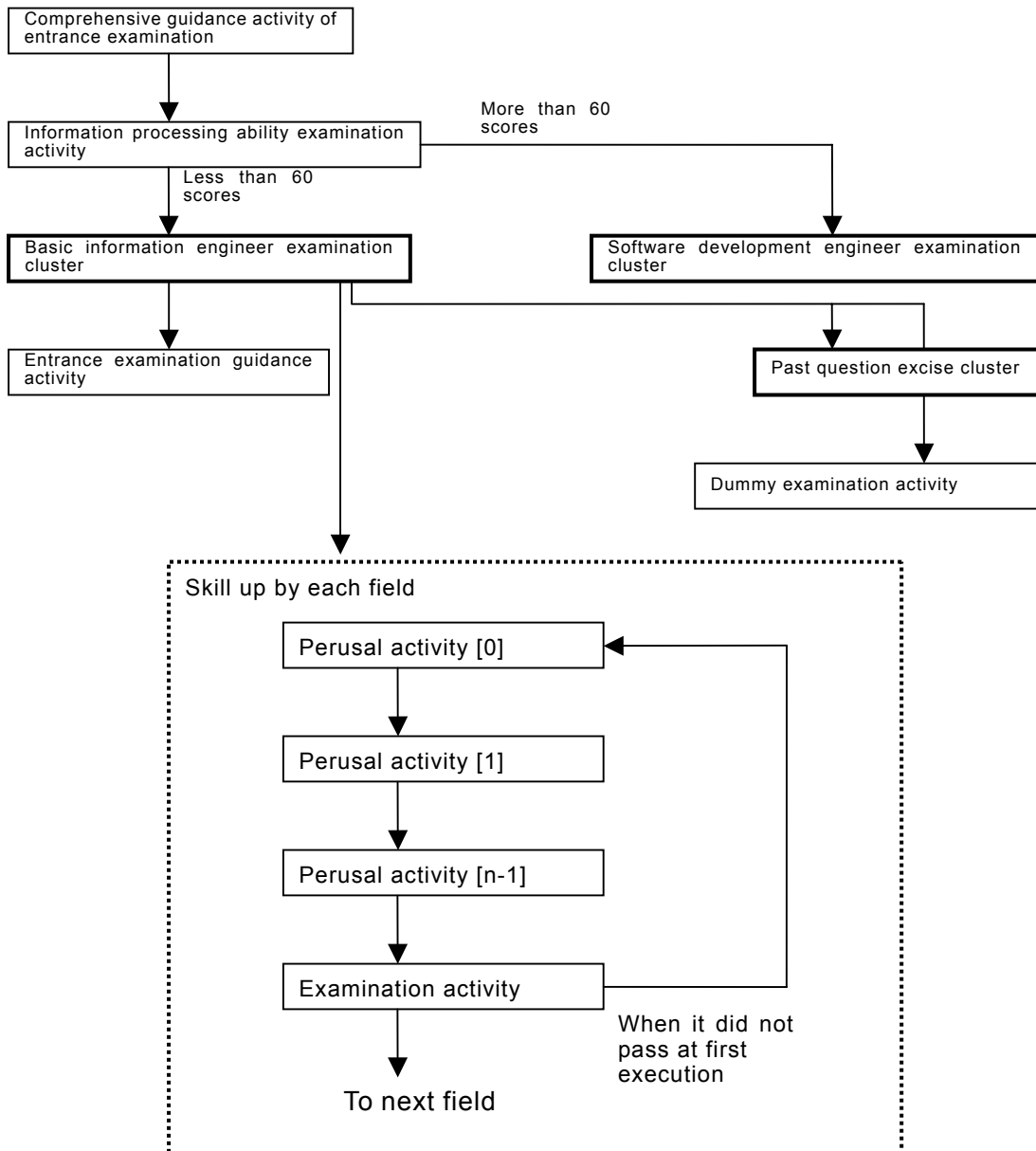


Figure 2-4 Learning procedure (Information processing engineer examination Skill up edition)

This examination is also divided into more than and less than 60 scores, and skill

up of learners who are low skill is to be performed. Perusal shall be performed by each field to examine whether learner was able to understand. In the case the record does not reach passing score, retry shall be enforced. If passing score, let him understand the next field. Thus, understanding shall be raised in each field to increase skill up.

The third one is titled as the boy’s baseball “Let’s play catch ball” that the contents consist of 2 sections, and the following figure is the learning flow.

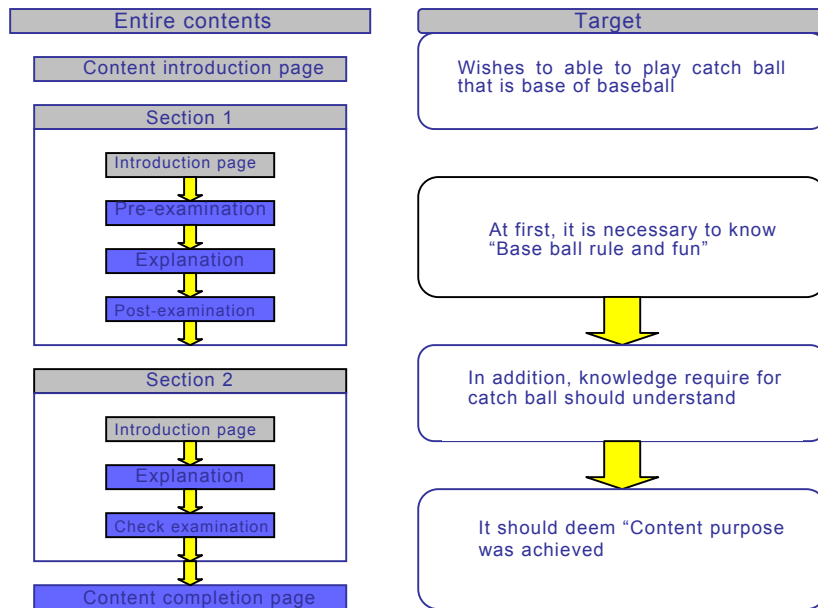


Figure 2-5 Learning procedure (Boy’s baseball content)

Section 1 is the “Flow” type realized in the SCORM 2004 sequencing.

10 quiz (questions) has been recorded in pre-examination. Explanation SCO corresponding to each question has been provided. It has been realized with the sequence function by reactivating only SCO of explanation that was wrong answer. In learner stance, only “Advance to next” button at content screen is pressed, and the operability has been excellent.

Post examination has realized “Retry” function in sequencing. If 1 question is wrong in the post examination, learner cannot leave from this post examination. Learner can advance to the section 2 by correct answer of all 10 questions.

Section 2 is the “Choice” type realized in the SCORM 2004 sequencing. Learner can directly start up from menu that each topic was provided by LMS. Due to this, learner can learn from the topic that he is interested in.

(4) Utilization method, etc.

The guide has been provide in each sample content, and each content constitution and the detailed explanation of movement are described. Refer to the guide when the sample content is to operate.

Furthermore, the boy's baseball "Let's play catch ball!" effectively utilizes video, and since the diversified types of user interface are employed, in quiz portion, this will become reference of SCORM content production.

2.1.4 Technical tendency of e-Learning in each country

2.1.4.1 Technical tendency of standardization, etc. in Japan

Questionnaire in this year was performed to the eLC members (100 companies) and the e-Learning related business enterprises (50 companies) of non-members. Furthermore, the questionnaire was performed to e-Learning business responsible personnel and development managers, and 63 persons from eLC members (30 companies, Business responsible personnel: 30/development managers: 33), 17 personnel from eLC non-members (10 companies, Business responsible personnel: 10/Development managers: 7) were replied.

The breakdown of e-Learning business of eLC member 30 companies replied by this questionnaire surveillance (duplicated answers) is as follows: about 1/3 of vendors performs LMS related business (development and sales), 2/3 of vendors performs content related business (development and sales), and 2/3 of vendors is performing e-Learning operation service and educational supply service by e-Learning.

At first, as the result of that the standard being employed by 23 companies who are developing was investigated, SCORM 1.2 is 11 companies (48%) highest, SCORM 2004 is 5 companies (22%), non-compatible general standard is 5 companies (22%), and 70% of them is developing with general standard recognized. Since the SCORM compatibility in last year was approximately 52%, the standardization compatibility has been remarkably increasing. Furthermore, same surveillance was also performed to e LC non- members. It was only reference data because the number of reply was 10 companies low, however general standard compliance is 30% (3 companies), general standard compatibility is 40% (4 companies) and the result was that eLC member companies who were promoting for standardization was higher than non-members.

Concerning the content development that interoperability operated with different several LMSs were considered, the companies who considered to operate with different several LMSs by employing general standard such as SCORM, etc. in advance are 14, and movement to keep the interoperability along with the general standard was observed.

Regarding the tackling with SCORM 2004 which is latest standard, standard already tackled is 22% (3% in last year), scheduling to tackling within 1 – 2 years is 48% (48% in last year) and 70% of the all will be employing SCORM 2004 in near future.

Table 2-5 Employing status of SCORM

Question content	Item replied	This year	Last year
Main general standard of development	SCORM	70%	52%
	Non-compatible general standard	22%	33%
Compatibility to SCORM 2004	Already tackled with	22%	3%
	Scheduling to tackling within 1 – 2 years	48%	48%
	No scheduled	22%	36%
	No replied	8%	5%
Content development operated with different LMS	General standard such as SCORM, etc. was employed, and was operated with both LMS	100%	41%
	It was re-created so as to operate special LMS compatible standard with other LMS	0%	41%
Content to be developed this year	Non-distribution purpose	73%	59%
	Distribution purpose	27%	41%
	SCORM compatible standard of distribution purpose	41%	50%

Secondarily, concerning meaning, importance, etc. of standardization, the following shows replies from the eLC member 30 companies (e-Learning business responsible personnel (30 persons replied)) and e-Learning development division managers (33 persons replied).

% figures with gothic are highest answers, and screening figures are items with large difference of business responsible personnel and development managers.

Table 2-6 Necessity of standardization

Item	Replier	e-Learning business responsible personnel				e-Learning development manager			
		Yes	No	Hard to judge	Not know	Yes	No	Hard to judge	Not know
Do you think standardization is an important to develop your department business?	Questioned item for standardization	63%	13%	23%	0%	61%	15%	21%	3%
Do you think Standardization has been penetrating into Japan?		30%	37%	30%	3%	39%	33%	24%	3%
Do you think standardization becomes an important for e-Learning users?		70%	13%	17%	0%	52%	3%	39%	6%
Do you think standardization (SCORM) is enough specification for education service supplied?		13%	40%	33%	13%	21%	42%	24%	12%
Do you think standard is necessary for distribution and reuse of content?		77%	13%	10%	0%	67%	12%	21%	0%
Do you think standardization relates to reduction of development cost of content?		37%	20%	40%	3%	42%	27%	24%	6%
Do you think standardization expands content product selection range of client?		67%	7%	27%	0%	67%	15%	18%	0%
Do you think standardization is not desirable due to restricting product function frame?		17%	37%	43%	3%	6%	45%	48%	0%
Is related information for realizing standardization currently sufficient?		30%	50%	13%	7%	27%	55%	12%	6%

Negative opinions for standardization are entirely plenty, and large difference between business responsible personnel and development managers are not observed. When looking at the item numbers that such conscious difference is conspicuous, there is strong opinion that this is penetrated into the business responsible personnel at , however there is strong feel that this has been penetrated into the development manager. Furthermore the standardization is considered to be important as the business responsible personnel at the item Nos. and , however the conscious difference from site developer is slightly observed. In addition, Concerning the question of “Is standardization at the item No. restricted by the product function frame?”, gap that the business responsible personnel has slight conscious framed imaginatively while the site developer almost does not have such opinion, is observed. Anyway, in order to promote standardization more, the opinions that further information release is mandatory, exceeds 50%.

When this questionnaire was summarized by 17 business responsible personnel and development managers of eLC non-member 10 companies, the result was as follows:

Table 2-7 Necessity of standardization viewed from eLC non-member

Replier (eLC non-member) Questioned item for standardization	Business responsible personnel and development manager			
	yes	No	Hard to judge	Not known
Do you think standardization is an important to develop your department business?	35%	12%	35%	18%
Do you think Standardization has been penetrating into Japan?	29%	18%	35%	18%
Do you think standardization becomes an important for e-Learning users?	47%	6%	29%	18%
Do you think standardization (SCORM) is enough specification for education service supplied?	0%	6%	47%	47%
Do you think standard is necessary for distribution and reuse of content?	45%	0%	18%	36%
Do you think standardization relates to reduction of development cost of content?	18%	35%	29%	18%
Do you think standardization expands content product selection range of client?	56%	17%	17%	11%
Do you think standardization is not desirable due to restricting product function frame?	19%	25%	44%	13%
Is related information for realizing standardization currently sufficient?	6%	61%	6%	28%

The feature of eLC non-members is that the reply ratios of “Not known” and “Hard to judge” are comparatively high, and it is seemed that public information for standardization will be insufficient. Furthermore, the conscious of standardization is seemed to be weak compared with eLC members.

Recognition and tackling of the development managers regarding the latest SCORM 2004 standard are as follows:

- 74% of the development managers knows SCORM 2004 (eLC non-members know only 43%),

- Expectation (may be used for content development) to the SCORM2004 new function (simple sequence function, etc.) is 62%, and it is observed to highly expect the new function.
- The correspondence to SCORM 2004 is “Perform aggressively (27%)”, “Perform if client needs are high (54%)” and “Not interested in tackle with (4%)”, and it is seemed to currently watch client tendency.
- Most of opinions on necessary condition for introducing SCORM 2004 were as follows:
 1. Japanese language of SCORM 2004 standard (73%)
 2. Content production know-how manual (65%)
 3. Guide for standard (62%)

2.1.4.2 Technical tendency of standardization, etc. overseas

The number of replies was 15 persons in 9 countries. The breakdown was 1 for China, 1 for Indonesia, 2 for Korea, 3 for Laos, 2 for Malaysia, 1 for Philippine, 2 for Singapore, 1 for Thailand and 2 for Viet Nam. The number of replies is only 15 persons low, however the all is AEN members, and it is considered that the content reliability is high due to e-Learning professionals. Furthermore, different replies from same country used high ranking number. Table 2-8 shows the survey result.

Item No. 1 Propagation is asked by the item No. 1, and almost not propagated is 0 country, being propagated is 3 countries, propagating is 2 countries and already propagated is 4 countries, and the difference is large depending upon country.

Item No. 2 Content distribution was asked by the item No. 2, and content product that had not almost distributed in the market (- several ten products) was 2 countries, some amount of content products that had been distributing in the market (- several hundred products) were 5 countries and many content products that had been distributing in the market (- several thousand products) were 2 countries.

Item No. 3 SCORM standard application was asked by the item No. 3, and the product employing the SCORM standard was less than 10% but 3 countries, the product employing the SCORM standard was 10 – 30% but 3 countries, the product employing the SCORM standard was 30 – 50% but 1 country and the product employing the SCORM standard was 50 – 70% but 1 country and the product employing the SCORM standard was more than 70% but no country. As the results, the countries complying with SCORM standard with more than 30% is 3, and Japan is behind in this area.

Item No. 4 The SCORM standard version was asked by the item no. 4, and 1 country was not almost used the SCORM standard, 5 countries used a

number of SCORM 1.2, 1 country used a number of SCORM 2004 and 2 countries used 50% of SCORM 1.2 and 50% of SCORM 2004. Concerning the above results, gap that SCORM 2004 was not almost propagated in Japan, was observed.

- Item No. 5 The number of LMS vendors was asked by the item No. 5, and average reply is 16 companies, however the breakdown is 25 – 50 companies in 3 countries, and others are 0 – 10 companies.
- Item No. 6 The number of contents was asked, and average reply is 90 companies, however the reply of 60 – 700 companies is 3 countries, and others are 2 – 30 companies.
- Item No. 7 The total sales of e-Learning relation was asked. Since the question might be difficult, the number of replied countries was only 4, and - \$10 million was 0, - \$100 million was 2, - \$1 billion was 0 and more than \$1 billion was 2.

Table 2-8 Technical tendency of standardization, etc. overseas

Item No.	Questionnaire					
1	Concerning stage of e-Learning propagation, select appropriate item in your country.	0	3	2	4	-
2	Are the many e-Learning related products available in the market?	2	5	2	0	-
3	Are the content products in domestic market compatible with SCORM standard?	3	3	2	1	0
4	Which SCORM standard of content products are used in domestic market?	1	5	1	2	-
5	Assume the number of content vendors related to domestic e-Learning business and fill out.	16	-	-	-	-
6	Assume the number of vendors related to domestic e-Learning business and fill out	90	-	-	-	-
7	How much is annual total sales of domestic e-Learning business?	0	2	0	2	-

Note: Meaning of questionnaire choices is as follows:

- Item No. 1 : e-Learning has not almost propagated (less than 2%)/ : e-Learning has started propagating (2 - 10%)/ : e-Learning is propagating (10 - 30%) : e-Learning has already propagated, and leading universities and enterprises are almost using (more than 30%).
- Item No. 2 : most of content products is not distributing in the market (- several ten products)/ : many content products are propagating in the market (- several hundred products)/ : a number of content products is distributing in the market (- several thousand).
- Item No.3 : the products employing SCORM standard are less than 10%, : the products employing SCORM standard are 10 – 30%, : the products employing SCORM standard are 30 – 50%, : the products employing SCORM standard are 50 – 70% and : the products employing SCORM

standard are more than 70%.

Item No. 4 : the SCORM standard is not almost used/ : SCORM 1.2 is many/ : SCORM 2004 is many/ : SCORM 1.2 and 2004 are 50% - 50%.

Item No. 5: Total average value of countries answered

Item No. 6: Total average value of countries answered

Item No. 7: : \$ - 10 million/ : \$ - 100 million/ : \$ - 1 billion/ : more than \$1 billion.

2.1.4.3 Occurrence status and analysis of interoperability problem

(1) Surveillance result at this time

8 problems were arisen as an interoperability problems. Of 4 problems corresponded to item Nos. 1, 14, 15 and 16 of cause classification table. Other 4 problems are as follows:

Even the test result does not fulfill the mastery score, it is to complete as course.

Since the standard itself is vague, interpretation of the lesson_status differed between LMS and content side.

Hierarchy of manifest is limited.

If the identifier value of SCO written in the manifest file is not started by special character, it did not operate

These are analyzed. At first, is that setting of lesson status by comparing the mastery score with the score is not performed, and is considered to correspond to the item No. 9 of the cause classification table. is also considered to be problems of lesson status of the item No. 8 or 9. is not included in the following cause classification table, however assessor short course, etc. of eLC is handled as failure case. is first case, however it is considered to be problem that can be detected by applying LMS by the ADL test suite. Thus, newly appeared problem is 1, and it is considered to be avoidable using the test suite when developing product.

Table 2-9 Cause classification table

Item No.	Large classification	Small classification	Explanation
1	Manifest file	Difference of character code of manifest file	Character code of manifest file has not been unified. Both Shift-JIS character and UTF-8 character exist.
2		Distinction of capital and small characters of URL of SCO	Since the web server distinguished capital and small characters, 404 error occurred.
3		Absolute bus and relative bus of URL of SCO	URL of SCO written in the manifest file has become URL (URL "absolute bus" starting from "/") from site top, LMS cannot interpret, resulting in no operation.
4	SCO startup	Retrieval order of FindAPI	The retrieval order of FindAPI does not go up from SCO to main frame, has set to retrieve from top frame to down, and due to this, API frame cannot be found, resulting in error.
5	API function	Argument of LMSInitialize does not exist	There is SCO that calls LMSInitialize without argument, and due to this, LMS detects error, resulting in no operation.
6		Return value of LMSInitialize is Boolean	There are SCO created by assuming that return value of LMSInitialize becomes Boolean (theoretical value), and due to this, LMS detected error, resulting in no operation.
7		Repetition of LMSInitialize and LMSFinis	There was SCO that did not call LMSFinish but frequently called LMSInitialize, and error occurred.
8	Data model	Vocabulary of lesson_status is incorrect	The value of lesson_status sent from SCO is "pass" and "fail", and LMS value cannot be properly acquired.
9		LMS that lesson_status operation has not been installed	There was LMS that lesson_status had reflected only SCO write value and initialization and status change thereafter was not properly installed.
10		LMS that learning time is measured by lesson_status value	There is LMS that learning time from setting "imcomplete" to lesson_status till setting "completed" is measured, and due to this, the learning time cannot be properly measured.
11		Premise condition and lesson_status value	"Passed" was needed to receive in order to satisfy the premise condition at LMS side, but SCO outputted "completed".
12		Value of cmi.core.score.raw is out of range	The value of cmi.core.score.raw outputted from SCO is not within range.
13		LMS operation when Masterscore is 0	Operation is not stable depending on LMS when masterscore is 0.
14		LMS operation when masterscore is empty	There is LMS that does not operate if masterscore is empty.

15		Handling of option data element not installed	When SCO using option element was operated by LMS without installation of option element, error occurred.
16	LMS	It is SCORM complied LMS, but material cannot be transplanted	Authoring tool attached to SCORM complied LMS can only create material of unique style, and cannot transplant to other LMS.

(2) Transition of surveillance result

Up to this time, 3 surveillances of occurrence status of interoperability problem were performed about 1 and half year interval. Table 2-10 shows the number of occurrence and the number of types of new failure. As shown in the table, the number of failure occurrence has been remarkably decreasing every each surveillance. Furthermore, new type of failure has occurred only 1 type at last and this time. From the result, it is assumed that problem regarding interoperability has been converging. eLC has reviewed the interoperability problems found up to date, and has stated and released the content and countermeasure in “Application technology for SCORM interoperability improvement by case study”. The policy is seemed to remarkably contribute prevention and solution of the interoperability problems.

Table 2-10 Transition of number of interoperability problem occurrence

Date surveyed	January 2004	December 2004	October 2005
Number occurred	54	34	8
Type of failure	33	—	—
Type of new failure	33	1	1

2.1.5 Information exchange regarding interoperability maintenance, etc. with each AEN country and standardization organization

2.1.5.1 AEN-WG 1 International Conference

(1) Conference overview

The AEN-WG1 International Conference was held in Tokyo in December 14, 2005. The participants from overseas were 13 of 12 countries, 4 participants were participated from Japan, and presentation of each country status and opinion exchange regarding the interoperability were performed. 1 observer from ADL was also participated, and addressed the activity status of ADL.

(2) Participants

Table 2-1 International conference participant list

Country name	Participant name
Cambodia	Mr. Om Sethy
Cambodia	Mr. Sok Tha
China	Mr.Ronghuai HUANG
Indonesia	Mr. Robert Siagian
Korea	Mr.Ju Hyung Lee
Laos	Ms. Khampheng Phathadavong
Malaysia	Mr. David Asirvatham
Myanmar	Dr. Pyke Tin
Philippine	Prof. Rufino Mananghaya
Singapore	Mr. Lim Kin Chew
Thailand	Dr. Niracharapha Thongdhamachart
Viet Num	Mr.Lam Quang Nam
USA	Ms Jennifer Brooks
Japan	Nakabayashi chairman, Toida, Miyauchi and Shibata

(3) Content of major opinion exchange

(a) Korea (presenter: Mr.Ju Hyung Lee)

Q) We would like you to explain of technical difference and meaning of 2D and 3D.

A) Basically, These have been realized with local environment of lecture attendants. All of these realize the virtual reality education, however 2D is ordinal content that realizes by “Flash”. 3D is currently under development, and the concrete contents are unknown.

(b) Malaysia (presenter: Mr. David Asirvatham)

Q) We would like you to explain of the ASEAN e-Learning Center.

A) There is function such as original Proposal Center of the Department of Telecom, and they are performing the following things:

- Performs development for ASEAN,
- Performs the platform development, and
- Obtains feedback.

It is assumed to be future issue how they collaborate with AEN.

(c) Singapore (presenter: Mr. Lim Kin Chew)

Q) We would like you to explain of SCORM compatible LMS.

A) We are using the BlackBoard, and many users are using at earlier stage. 10 schools were using this in last year, and 20 schools are using this year. A large issue is how we are expanding this in future.

Q) What kind of private sector has SCORM been using?

A) The current status of SCORM market is still small. Many companies actually bankrupted or are facing with crisis of bankrupt, and are suffering from budget cut, many problems and others, however the SCORM problems are not captured as a large problem.

While, in order to propagate this, we recognize that most important thing is to keep having a patient passion.

(d) Thailand (presenter: Dr. Niracharapha Thongdhamachart)

Q) Do you have any problems in Thai language?

A) Yes, we have. There are many domestic problems. Many products have not been SCORM compliance yet, and since contents, etc. can not be correctly imported, they may be problem before language. We are suffering from various types of error.

Q) We would like you to explain of the e-Learning status of civil enterprises in Thailand.

A) Actually, there is the NSTDA belonging to National Science and Technology Development Agency, and they are severely preserving to the SCORM compliance, and complies with SCORM 1.2.

Q) Concerning the content development, how are you promoting in Thailand?

A) We are using the open source using CMS (content Management System) called "noodle" and "Atutor" . We are also developing the contents using game engine.

2.1.5.2 Corresponding conference with ADL

(1) Conference overview

In ADL (ADL Alexandria Co-Lab, Alexandria, Virginia USA) in September 21, 2005, discussion of ADL and AEN cooperation, etc. was performed. As the result of discussion, understanding of ADL leader regarding cooperation to AEN activity including attendance to the AEN International Conference was obtained.

(2) Attendant

- ADL attendants
 - Mr. Phillip Dodds, ADL Chief Architect
 - Mr. Paul Jesukiewicz, Alexandria Co-Lab Director
- AEN attendant
 - Nakabayashi, Chairman

(3) Major description

- Introduction of SCORM pen source engine, SCORM assessor activity and AEN

activity. These activities are highly evaluated as ADL.

- Cooperation request regarding SCORM standard translation. This is also an important activity for general standard propagation to each country, and they promised they would fully cooperate us.
- Participation request to AEN conference in December. They are excessively expecting interoperability experiment (ALIVE), etc. of SCORM 2004, they promised us someone would directly participate in.
- Development tendency of the ADL technologies such as SCORM, CORDRA, S1000D, etc. SCORM will enter into the maintenance phase. CORDRA is dispersed lipogitory standard and starts to use within ADL by operating the prototype. S1000D is try that various design documents and learning materials will integrate.
- Overview of the Mel bourn SCORM Stewardship Conference (refer to sub-section 2.1.5.3) in October. We are expecting participation of each country government level, and Australia, Canada, England, Korea, Taiwan, etc. are scheduled to participate with such level.

2.1.5.3 SCORM Stewardship Conference

(1) Conference overview

We participated in the SCORM Stewardship Conference (official conference name: Advanced ADL through Global Collaboration) held in Mel bourn in October 3 – 6, 2005. The sponsor of conference was ADL and the Department of Australia Education, and the conference was divided into forum and technical workshop. Nakabayashi , a chairman participated in from Japan as the AEN representative, and performed presentation, etc. of the AEN activity status.

(3) Participating country and body

e-Learning propagation body related personnel of each country such as Australia, Korea, Mexico, Singapore, Taiwan, USA and England.

Each standardization body representative of ADL, ADL Co-Lab, IEEE LTSC, IMS, ISO/IEC JTC1 SC36, and CEN/ISSS LT-WS.

(4) Conference background and purpose

- ADL in USA had been performing various activities such as standard development, tool development, propagation enlightenment, etc. regarding SCORM and e-Learning standardization technologies by DOD support since 1997.
- The SCORM standard has been also widely propagating other than USA. On the other hand, in order to maintain and manage the standard, organization and resource that are required, however there is debate regarding the propriety of that propagation and maintenance management other than USA is continuously supporting.
- There is ADL Co-Lab and ADP Partnership Lab as organizations who propagate

and support AD activities. In the past, these organizations were limited to universities in USA but have been established in Canada, England, Australia, Korea, etc. by joint with local government institutes in current year.

- Based upon such background, this conference has been held in order that each related country and various bodies gathered and debated regarding the direction in order to succeed and shift various activities of ADL up to date to the international organization (Stewardship).
- For the basic concept of succession, there is the document that debate points are shown.

(<http://www.adlaustralia.org/aatgc/stewardship-mclean.pdf>)

As the Stewardship style, participation of national institutes and NGO bodies have been emphasized, and the case that internet was shifted from ARPA under the DOD to IETF of civil base, is assumed as a model.

(5) Conference description

Forum

- Concerning the direction to the aforementioned Stewardship establishment, each country and the related standardization bodies presented the position paper regarding each own position.
- The presentation was almost affirmative. Points of each country presentation are as follows:
 - Japan: Open membership even country that does not have back up of resource can participate. Cooperation with official standardization body such as ISO,
 - Korea: Operation model that was precisely conscious continuation,
 - Singapore: Establishment of advisory committee. Regulated model, and
 - Australia: Establishment of integrated secretariat, user group and advisory committee.
- Comment of Robby Robson, IEEE LTSC chairman
 - Discussion was performed based on (<http://www.adlaustralia.org/aatgc/stewardship-robson.pdf>).
The points are as follows. These will be continually discussed in future.
 - What is Stewardship subject to?
 - What are common targets of participants?
 - What is subject of Stewardship?
- Discussion for Melbourne common statement was performed, and consensus of each participating country was obtained.
 - International cooperation for common infrastructure promotion of e-Learning will be performed.
 - Based upon current ADL activities, the Stewardship organization will be established about 3 years later.
 - ADL will take initiative, and administrator conference for promotion and user meeting will be performed.

Technical workshop

The technical workshop that performed briefing of SCORM, CORDRA and

S1000D was held.

(6) Opinion exchange with sponsor

- A representative of ADL is to invite to the AEN conference to be held in Tokyo in December, and this conference pattern makes each AEN country inputted.
- A representative participates in the International Plugfest to be held in Taiwan in next January.
- Neil Mclean of the Department of Australia Education that is one of sponsors this time will be visiting Japan early next year, and opinion exchange will be performed.
- Theme of technical cooperation with Korea, Taiwan and others will be searched.
- Participates in the administrator conference to be held up to the first half of next year.

(7) Opinion and comment of participants

- If necessity of the technical standard for e-Learning propagation is to be considered, Japan is necessary to participate in the international activity regarding development and propagation. However, this is not entire e-Learning conference, and a care should be taken for only focusing the technical standard.
- It is unknown whether ADL initiative activity this time has any degree of centripetal force in future. However, the e-Learning standards that are currently and concretely installed and used are only SCORM and LOM, and it is seemed to be no problem that this activity obtains a certain support of each country.
- In this activity, it is assumed that Australia, Canada, Korea, etc. that are partnership of ADL and domestic system has been established, have influence. Cooperation with these countries through various opportunities is required.
- Japan has maintained a certain presence up to date, by appealing the propagation activities to domestic ALIC to oversea. Furthermore, since 2000 when ALIC was established, Japan has been participating in the activities such as ADL, IMS, IEEE LTSC and SC36, and has also established human connection. However, clarified support system does not currently exist in Japan, and it is considered to be difficult to participate in continuous activities as similar to the above-mentioned countries. A large future issue is how domestic support system should be built.

2.1.5.4 International Plugfest II & SCORM 2006

(1) Conference overview

The conference titled “International Plugfest II & SCORM2000 (official name: International Plugfest II, The 2006 International Conference on SCORM2004)” was held in Taipei (Taiwan) in January 16 – 19, 2006. The sponsors were ADL and Taiwan universities Tamkang University, National Central University, Southern Taiwan University of Technology), and about 300 attendants in total were participated from Taiwan and overseas. The conference contents were mainly SCORM initiative conference and validation experiment. 3 members of Nakabayashi, chairman, Toida and Miyauchi of AEN-WG1 participated from Japan and presented the AEN activity status, etc.

(2) Participating country and organization

e-Learning related personnel of each country such as Australia, Japan, Korea, Mexico, Singapore, Taiwan, USA, Germany, Italy, India, etc. , ADL, ADL Co-Lab and IEEEELTSC.

(3) Background and purpose of conference

ADL had been periodically holding the Plugfest as purpose of e-Learning standard propagation in addition to SCORM. This conference was held as the 2nd International Plugfest outside USA, following Zurich in 2003. Together with this conference, the international science council regarding SCORM 2004 “International Conference on SCORM 2004” was also held.

Furthermore, this event is also conference follow-up purpose regarding the SCORM Stewardship implemented in Melbourn in last October. Due to this, Each member of Australia and each country that is interested in SCORM international propagation gathered, and policy presentation, product and technical presentation and science presentation in addition to interoperability experiment, were performed in parallel by 3 parallel tracks.

(4) Conference description

(a) Plugfest

In first day of January 16, tutorial regarding the ADL technologies such as SCORM, CORDRA, S1000D, etc. was performed, and in 17 – 19 December, presentation was performed by splitting into Plenary Session and SCORM 2004 Product Demonstration Session. Reporter mainly listened the tackling status regarding the ADL technologies of each country at the Plenary Session and presented the activities of Japan and AEN. Major topics are as follows:

- As to the Stewardship, presentation that called participation of each country was performed by Robby Robson of initiative member IEEEELTSC and Neil Maclean of the Department of Australia Education. It was pointed out that clarification of activity scope, maintenance of activity fund, clarification of membership qualification were future issues. The opinions of conference showed as follows: especially searching cooperation way with ISO/IEC JTC1 SC36 in future; planning clarification of activity parent body as international activity; due to this, scheduling to hold any conference by SC36 Peking Conference in this coming September.
- Concerning the Partnership Lab that ADL is point of activity in each country, the following was introduced: England and Canada officially entered into the MOU, are under activity; Korea, Australia and Mexico are scheduled to enter into the MOU, are under adjustment; and Taiwan will be entering into the MOU in future.
- Concerning the Stewardship, the activity statuses were reported from Japan, Australia, Mexico, Taiwan and Korea.
- Release of the latest edition of SCORM 2004 (3rd edition) scheduled to modify was postponed. Currently, draft opening at end of January and opinion

collection for 90 days are performing, and official edition will be releasing around July.

- Concerning Japan and AEN activity, “Assessor”, “Open source engine”, “AEN WG and ALIVE” were presented as major points. Since the information of “AEN has been completed” was informed, we orally explained “Under adjustment of continuation by ASEAN frame”.
- In the tutorial program, details was discussed regarding SCORM history, effectiveness, feature, Co-Lab introduction and future direction. Furthermore, as a large point, ADL was intending to shift from SCORM development phase to maintenance phase. They clearly says they will not perform large modification after SCORM 2004. Further, it was that activity center would shift to CORDRA.
- Regarding the setting program, difference of SCORM conformance and SCORM certification was also explained. It was explained that certification was validated by ADL and it was able to check using conformance ADL Test Suite Software (SCORM2004: Self Test Suite1.3.2 (in case of SCORM 2004)). Furthermore, it was also explained that it became from SCORM 1.2 to SCORM 2004 an Conformance/Certification Levels became level 1 on both LMS and content package. While, it was that SCORM adopter vendor currently reached 143. It was also emphasized that very plentiful information had been stated in the ADL site. Certified LMS and content have been stated on the site.
- As SCORM 2004 content development tool, Reload Editor 2004 was introduced, and ADL recommend to use this tool.

(b) International Conference on SCORM 2004

The conference was held for 3 days on 17 – 19. The number of presentations were 29, and the breakdown by country is as follows:

Taiwan: 16, Japan: 4, UAE: 2, India: 2, Italy: 1, Brazil: 1, China: 1, Pakistan: 1 and Holland: 1

Presentations by Taiwan of sponsor were so many, and it was observed that active activities regarding actual system, tool, content installation and SCORM propagation had been performing.

Reporter presented installation and performance evaluation of SCORM 2004 open source engine.

(c) Plug N Play

Plug & Play area performed the interoperability experiment of LMS and content, and it is place to check interoperability between SCORM 2004 products. Here, opinion exchange and problem solution can be performed by checking actual operation. In the place, table, receptacle and LAN cable were provided, and each product could be freely tested. Tables for 15 companies had been provided, and 5 or 6 companies had been performing tests.

Most of vendors have visited for the LMS testing, and vendors visited for content testing were nearly none. Vendors who contents were provided also

looked to divert the contents for their LMS operation check as for testing.

eLC brought in 2 types of content used for ALIVE testing and the Open Source LMS (SCORM 2004 execution engine) and performed the interoperability experiment.

No problem occurred in content registration. However, problems frequently occurred in character display of Japanese/history keeping and sequencing operation. In most of LMS, log was collected in detail and was able to use for check and others of sequencing operation.

(5) Opinion and comment of participant

- In this conference, it is considered that the fact clarified for targeting SC36 as the parent body for international standardization is one outcome. Japan has been also aggressively participating in the SC36 activity, and stated that the ISO general standardization of SCORM would be supported from the viewpoint of domestic SCORM propagation status. In future, before movement of SC36 is advanced, closer cooperation will be continued by information exchange with each country. Especially, concerning the process that SCORM in SC36 is concretely standardized, there are many unclear parts, and Japan will also aggressively join in debate of standardization promotion by targeting Turk Conference in March and Peking Conference in September.
- In the above-mentions status, it is necessary to make clear the future direction of AEN activity by communicating to ASEAN. Under the status that Korea and Taiwan are aggressively advancing the activity, it is considered to become an important by diplomatically making it clear how the activity in Asia is positioning.

2.1.6 Summary of activity outcome

2.1.6.1 Activity outcome

(1) Preparation of SCORM 2004 propagation promotion material and content

In order to propagate and promote SCORM 2004, “SCORM 2004 guide”, “SCORM 2004 content preparation guide” and “SCORM 2004 sample content” were created. When these documents were presented at International Conference participants and SCORM assessor, it is favorable comment, and there are many requests for earlier supply. Especially, concerning simple sequence function that is feature of SCORM 2004, it is scheduled to supply as the e-Learning content that can actually operate and learn, and it is assumed to be effective for propagation and promotion.

(2) Grasping and countermeasure status of interoperability problem

As the result of that the occurrence status of the interoperability problem in site of e-Learning had been investigated, it was found that both number of occurrence and new failure had been converging. This is seemed to be true because creation and opening of “Application technology for SCORM interoperability improvement

by case study” has been contributing. New type of problem found this time was only 1.

(3) Information exchange with each country

We held 1 International Conference this year, participated 2 International Conference, and were able to perform information exchange with many overseas e-Learning related bodies and related personnel. Through information exchange, major points newly found are as follows:

- Korea is aggressively tackling with the e-Learning promotion more than Japan does, including SCORM by communication to ADL, etc. under his government instruction.
- Concerning maintenance of interoperability and SCORM propagation, each country has realized the importance, and is performing various activities.
- Tackling with e-Learning at ASEAN and international standardization activity of the SCORM standard has been started.

2.1.6.2 Future issue

(1) SCORM 2004 propagation and promotion

SCORM 2004 propagation and promotion documents provided this time and SCORM 2004 propagation and promotion by utilization of sample content and others.

(2) Continuous cooperation with overseas

Aggressive participation to e-Learning related International Conference and implementation of continuous communication with AEN overseas members.