The Effectiveness of Campus-wide e-Learning Supports Designed by an Extended ARCS Model

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This paper describes the effectiveness of the Instructional Design (ID) based activities aimed to assist faculty to utilize e-learning by e-learning support staff. We propose the ARCS+AT Model as an extension of the ARCS Model by J. M. Keller, as a framework for creating campus-wide support to motivate faculty to utilize e-learning. Based on the proposed model, we developed and formatively evaluated the ARCS+AT checklist for promoting e-learning at universities, which was made available on the ARCS+AT website with an exemplifying e-learning course of "Information Literacy." The checklist provides opportunities to learn what should be improved regarding institutional e-learning support. The course is designed to allow faculty to start e-learning with minimal preparation. Eight from the university faculty have adopted e-learning in their courses; we report their feedbacks to show how they were assisted to become e-learning users through the experience gained from these ID based activities.

Keywords: Instructional Design, ARCS Model, ARCS+AT Model, website, e-learning

Introduction

Japanese universities only recently started activities to develop e-learning or use Information and Communication Technology (ICT) in education. According to the National Institute of Media and Education (NIME) (2009), more than 70% of the Japanese universities are using ICT tools in education and more than 50% are operating a Learning Management System (LMS). However, they have difficulties in achieving efficient and effective outcomes from the use of ICT in teaching and learning. For example, many universities face issues, difficult to solve but crucial to overcome, in the areas of human resource and skills among others. Some say, "We don't have enough human resources for operating and maintaining systems or creating educational contents", and others say, "Many faculty members don't have enough skills for using ICT tools properly for their classes." To overcome these issues, e-learning support staff in higher education is expected to play a crucial role, while it depends on each institution's decision if such staff is classified as technical or administrative staff, or faculty members.

E-learning support staff often needs to work on actions at the institutional level if they are going to solve the above issues. However, sometimes it is beyond their administrative authority to take such an action. It is often not an easy task to reach a consensus on teaching and learning strategies at the institutional level. From the viewpoint of the "quality assurance in education", it is a real fact that many of Japanese universities have various structural issues (Ohmori, 2008). These organizational issues also make it difficult for e-learning support staff to move forward in promoting ICT-enhanced learning and teaching. Having said that, there have been some attempts to pursue effective management models for developing and implementing e-learning in Japanese universities (Miyahara et al., 2010). Therefore, it is essential to explore and develop the role of e-learning support staff in managing effective and efficient e-learning courses in higher education.

When considering the role of e-learning support staff, Faculty Development (FD) and Instructional Design (ID) might be keys. Every university in Japan is required to implement FD by law. If faculty members suggest their own FD plans for e-learning implementation to their courses and if they are accepted, such plans might become institutionalized. ID theories, on the other hand, can promote effective, efficient, and motivational teaching practices in various educational settings including e-learning. However, ID-based FD efforts are still at an immature stage. ICT oriented FD has been practiced at only about 20% of the Japanese universities (NIME, 2008). Most Japanese educators are not well aware of the practical value of ID (Suzuki, 2005). Nonetheless, some research has identified ID factors that can be utilized in the responsibilities of FD staff (e.g. Suzuki, 2009). This suggests that ID has potential to become an important tool for effective FD. In addition, planning and implementing e-learning will help universities clarify their institutional functions and solve instructional issues. It is therefore necessary for university e-learning support staff to understand these factors for creating and managing ID-based activities including those for FD.

Because of the above reasons, the use of ID theories in exploring and developing the role of e-learning support staff is an essential issue for both practical and research purposes. So far, however, the issue is rarely covered explicitly in existing research work. According to Victoria University of Wellington (2007), the university uses the E-learning Maturity Model (EMM), which aims to assess the capability of e-learning processes at an institution. EMM is a quality improvement framework with which institutions can assess and compare their capability to sustainably develop, deploy and support e-learning (Marshall, 2008). EMM was developed in 2003 and has been improved by incorporating feedbacks from those applying it. Although EMM is an institutional instrument to promote e-learning, the model is not based on ID theories but on process improvement methodologies.

Surry and Land (2000) proposed a framework of strategies for motivating faculty to use technology in teaching. This research presented strategies to enhance the motivation of individual faculty members to use technology based on the ARCS Model, but not extended the model itself. With regard to research in Japan, Kitamura et al. (2007) described a case of using ID theories and assuring the quality of e-learning in a Japanese graduate school, but did not particularly focus upon the role of e-learning support staff. Kato et al. (2005) described a case of Multimedia Information Center at a Japanese university as a key player of e-learning promotion for the areas of classroom support, inter-university activity support, and life-long learning

support. However, there was no direct relationship between what were proposed and ID theories.

The ARCS+AT Model (Nakajima, 2009) has been proposed as a framework for promoting e-learning at a university with a checklist for e-learning support staff to focus on faculty's motivation, based on ID theories. The practice of the model may consist of the following four steps: 1) Provide e-learning support staff's ID based activities to motivate faculty for utilizing e-learning, 2) Promote e-learning at the university effectively and efficiently, 3) Promote ICT oriented FD work, and then 4) Promote the improvement of the quality of education at the university. The purpose of this research is to present a case study utilizing the ARCS+AT Model for the first two steps: How ID based activities were provided and e-learning was promoted by the ARCS+AT website. This paper will describe how these steps were carried out at a university. It will also discuss how faculty can be motivated through their practice and how the ARCS+AT Model may work for promoting e-learning at other universities.

The ARCS+AT Model

The ARCS+AT Model (Nakajima, 2009) was proposed based on the ARCS Model (Keller & Suzuki,1985). The ARCS Model is one of the representative ID theories that presents a classification of motivational concepts into four categories (Attention, Relevance, Confidence, and Satisfaction) (Keller, 2008). Nakajima (2009) has extended this model by adding another category of "Assistance and Tools (AT)", which provides the concept of how e-learning support staff at a university can motivate faculty to try and utilize e-learning. In the extended model of ARCS+AT, the relationship between "e-learning Support Staff" and "Faculty Members (instructors)" at a university is equivalent to that between "Instructor" and "Learners" (Figure.1 and Table.1).
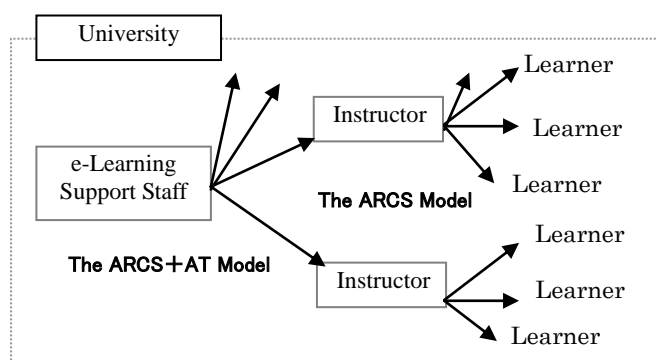

Figure 1. *Double Structure of the ARSC+AT Model*

The ARCS+AT Model provides e-learning support staff at a university with a useful checklist for helping to motivate faculty to utilize e-learning and improve the quality of the course. In addition, this model is oriented to lead a university to successful implementation of e-learning. The ARCS Model features the factors of "appealing instruction," which makes learners want to learn again (or more) when they finish a course (Suzuki, 1995). The ARCS+AT Model is also purposed to "appeal" to the faculty to like to utilize e-learning in their class again.

Table 1. *Comparison of the ARCS Model and the ARSC+AT Model*

	The ARCS Model	The ARCS+AT Model
Users	Instructors will use this.	e-learning support staff will use this.
Targets	Learners will be motivated.	Instructors will be motivated.
Objective	To motivate learners to learn	To motivate instructors to start e-learning
	- To guide learners to better learning outcomes	- To implement e-learning properly in class - To guide learners to better learning outcomes - To lead University to efficient and effective e-learning outcomes

The ARCS+AT Checklist

The ARCS+AT Checklist consists of checkpoints relating to each category of A, R, C, S and AT to identify points for improving the management of e-learning at a university (Nakajima, 2009). It is expected to allow e-learning support staff to be ready for motivating faculty for e-learning. For example, e-learning support staff will check if they have appropriate means to distribute e-leaning related information to faculty by this checklist. This is one of the checkpoints of the category "A" aiming to check if they can make faculty pay attention to it. If e-learning support staff answers "No" to the checkpoint, they will start to manage for designing or improving it within their capability. The checkpoints of each category have been developed by referring to the hint list of the ARCS Model (Suzuki, 2002).

The first author tested this checklist at ten universities and received feedbacks that this checklist worked well (Nakajima, 2009). This checklist will make the issues to be solved visible and encourage the staff to start planning or implementing improvement as described above. This does not mean to force them to take on more than they can by providing ideal goals that are too hard to reach. In this way, they will develop an idea of what can be done and which path to take to go forward.

As a practice of using the checklist, the first author implemented it at a private university in Osaka and identified issues that needed to be solved. An outline of the results is shown in Table 2. It is evident that this university had a function of supporting faculty in the area of using ICT for education, but was not ready for distributing information about e-learning persuasively. As a result, e-learning was not actively carried out. One of the reasons was that their human resource was limited. Then, the ARCS+AT Checklist suggested that e-learning support staff could create and open the ARCS+AT Website as a solution to supplement the limited human resource, which is simple enough for them. This website has already been released so that the university's faculty has started to receive e-learning related information through it. This indicates that the university has accomplished an important first step for implementing e-learning by using the checklist.

The ARCS+AT Website

The ARCS+AT Website can be provided to the ARCS+AT Checklist users as a supplemental

resource for improving e-learning environments. If the results of using the checklist show that the university needs more opportunities to distribute information about e-learning, this website would be a good solution. This website has links to information related to each factor of A, R, C, S or AT. Details of the website structure are described by Nakajima, et al. (2009). This website is constructed using only simple techniques so that any e-learning support staff from any university can edit and use it.

As described above, the first author used the checklist at a university. The university initiated an ARCS+AT Website as a result to distribute the information about e-learning through the website. One of the topics on the website is about an e-learning course material which was planned, designed and developed by the e-learning support staff themselves. This material was created aiming to be one of the contents which motivate faculty to utilize e-learning.

In order to gain the attention of faculty, the staff chose a theme for the course material that faculty wanted students to learn. Staff posted information related to the course material production to inform faculty of its progress. Since staff realized that faculty would hesitate to get involved when extra work was involved, they produced all of the course material, LMS settings, and learner manuals by themselves. In this way, e-learning support staff has been trying to pull "Expectation and Value" for e-learning (Suzuki, 1995) from faculty. For examples, the top page of the actual ARCS+AT Website and the information page of the actions for the course material are shown in Figure 2.

ID Based Course Material

"Information Literacy" was selected as a theme of the course material for the following reasons: 1) "Information Literacy" is one of the most important skills that all the students should acquire while they are attending a university (Ministry of Education, Culture, Sports, Science and Technology, 2008); and 2) it is more readily accepted by faculty as a supplemental material for a class. We describe the course material (design, management and assistance) that has been implemented since April 2010 as follows.

Figure 2. *The ARCS+AT Website*

Table 2. *Results of Checking at a University*

Attention: Interesting!	
A-1: Perceptual Arousal Have instructors notice that there are effective e-learning methods for courses. **A-2: Inquiry Arousal** Have instructors feel that it is useful to digitally provide resources of their research or teaching to their learners and think that they would like to use e-learning. **A-3: Variability** Make explanations to instructors about the effectiveness of e-learning as simple as possible.	ICT related portal site for faculty has been running. But it was not focused on e-learning. E-learning related paper distributions which have been provided are not well organized. Also, the mailing list must be used in better ways. We need to re-organize the environment for distributing information.
Relevance: I see the importance!	
R-1: Familiarity Show instructors methods of e-learning that can realize their ideal courses by talking about their actual courses. **R-2: Goal Orientation** Show instructors the importance of improvement by e-learning and have them set a goal for e-learning in their own course. **R-3: Motive Matching** Provide the information for e-learning that fits their IT literacy level. Try designing the best pace for the instructor.	We have done almost nothing for this factor because of the environment for distributing information which we have to re-organize. We would work on this factor as we work on the re-organization above.
Assistance & Tools: It is reliable!	
AT-1: Tool Information Give information about e-learning tools or systems that instructors can use. **AT-2: Assistance Information** Give information about staff support or assistance which instructors can get regarding using e-learning. **AT-3 ID (Instructional Design) Guidance** Give information about the "know-how" of ID that makes effective e-learning become real.	We have provided the support section and show what we can clearly. We have not explained or proposed about ID yet.
Confidence: I can do it if I try!	
C-1: Instruction Requirement Share the point of completion of using e-learning concretely with the instructor. **C-2: Success Opportunities** Prepare to compare the effectiveness of the course using e-learning with that of the one without it. **C-3: Personal Control** Give the instructor the initiative also for the things related to e-learning in his/her course.	We have done almost nothing for this factor because of the environment for distributing information which we have to re-organize. We would work on this factor as we work on the re-organization above.
Satisfaction: I'm glad I did it!	
S-1: Natural Consequences Prepare a check sheet to give the instructor an opportunity to see how the course was improved by e-learning. **S-2: Positive Consequences** Let instructor realize the value or the importance of e-learning by the learner's outcomes. **S-3: Equity** Maintain a standard of evaluation for the effectiveness of e-learning. Keep the system of assistance to provide instructor support equally.	We have done almost nothing for this factor, A working group with faculty has been managed, though. No incentives for e-learning activities. We would work on this factor as we work on the re-organization above.

Material Design

Upon designing the self-paced learning material, we referred to ID models or theories, such as the hint lists in the ARCS Model, Nine Events of Instruction, and the Systematic Approach Theory (Suzuki, 2002; Suzuki, 2005). For example, information is included at the beginning of a chapter so that learners will realize where they are in the course and what will be presented in each chapter (Figure 3). A formative assessment was conducted for appropriate revisions made to improve the quality of the course material.

The course material consists of 15 chapters and the contents of each chapter are presented as simple html pages and a set of LMS (Figure 4). Learners will read through the text pages and then complete assignments available through the LMS settings. The outcomes of the assignments will be shared in the LMS so that all learners will be encouraged by others. The instructor is able to easily check how learners progress by reviewing the management function of the LMS. As a result, the instructor can identify learners who are not doing well and easily follow up with them, too.
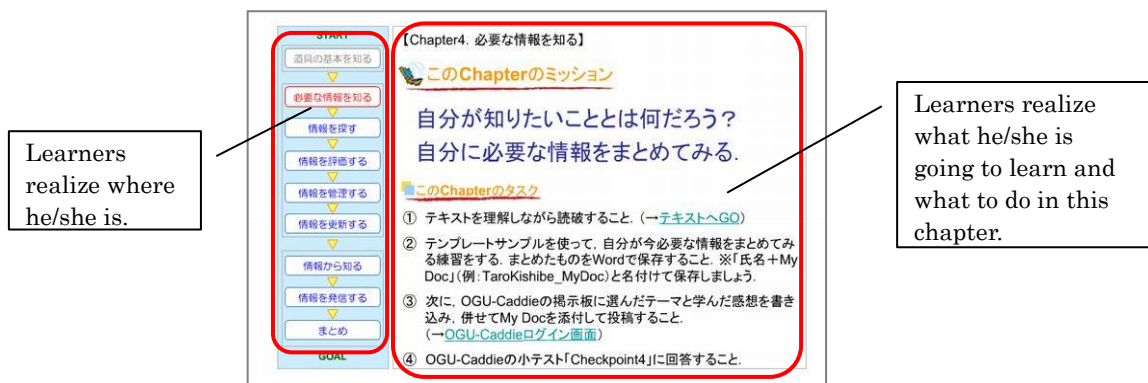
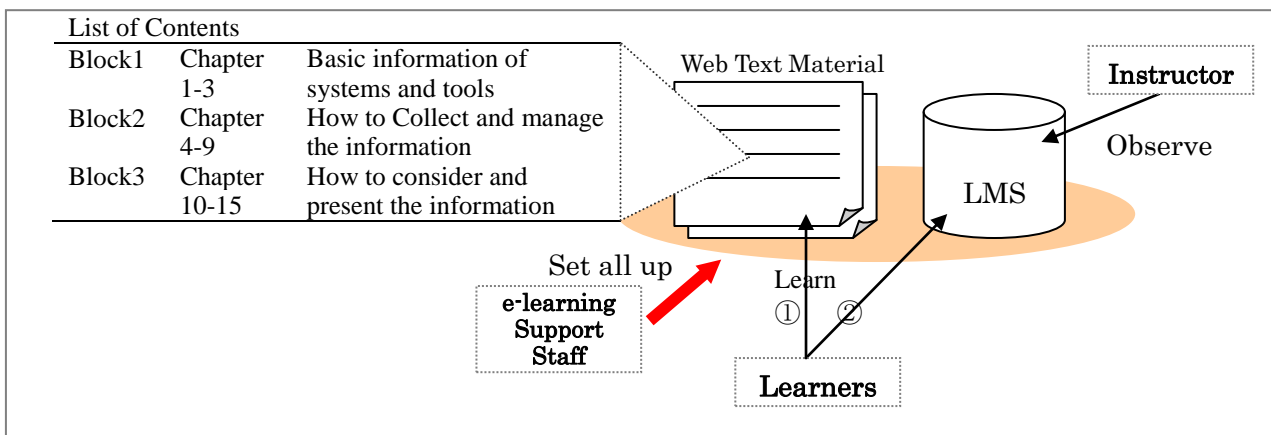**Figure 3.** *A Chapter Top Page in the Course Material*

Figure 4. *System Configuration of the Course Material*

The course designers developed the material by themselves so as not to expend any extra fund. For creating the html part, they paid attention not to use special techniques in order to allow any e-learning support staff to edit the material. Also, the LMS portion was created using only the basic functions that are available in any other LMS system so as to maintain the generality of the design settings. This may be a good example that shows how it is feasible for a small e-learning support section to develop e-learning materials. In other words, e-learning support staff from any university may easily initiate e-learning by adapting this material to their own environment.

Assistance & Tools

After preparing the products, the support staff moved to the phase of announcing to faculty. They had already started distributing related information on the ARCS+AT Website and had sent the information through a mailing list. When it got ready, the course material was made available and announced for use in the coming new semester. At the same time, they provided faculty with LMS settings for practicing.

Some faculty responded to the announcement. The e-learning support staff interviewed the faculty to review and share their class goals, their purposes for using the material and their expectations. The information was documented so that it could be reviewed at anytime. For the next step, the e-learning support staff set up the LMS for each class and provided a brief manual for students. They explained to the faculty how to request help and what they can expect from the support staff. The objective was to have the faculty gain confidence in using the course material without extra work for preparation or implementation.

Implementation

Eight faculty members with their 15 classes (587 students, mainly freshmen) were registered and started using the course material from April 2010. The learning methods used were: 1) self-paced learning which was assisted by faculty online or off-line, and 2) direct classroom instruction (Table3). "Self Learning" learners were guided to study each chapter between every class and submit questions by e-mail or face-to-face for items they could not solve. Upon finishing the course, learners completed a paper presenting what they had learned and practiced while studying the course material. In many classes, using this material served as an opportunity to practice writing reports.

After six weeks, the first author asked the faculty to complete a questionnaire. The questionnaire asked the following questions: 1) How is the faculty member managing the course? 2) How are the students studying? 3) Is assistance from the e-learning support staff adequate or not? 4) How is it going? Faculty answered each question by select one of five levels between "Yes" and "No".

Results and Expected Effects

Although classes were still continuing, we attempted to determine how well the course material

was working by reviewing responses to questions that were asked prior to the start of each class (Questionnaire-1, Table 4) and in the middle (Questionnaire-2 Table 5) of the class. In Questionnaire-1, faculty stated that "This is worth doing." or "We will be able to work it out." This indicates that they understood and agreed with the goal and the impact of this material. We may think that we were successful in guiding faculty to initiate e-learning.

Table 3. *List of Classes (That Are Using the Course Material)*

Class	Student Numbers	Style	Class Numbers
Seminar Class	About 10-25	Self Learning + Assisted by Faculty in between	8
		Instructed in Class	3
Regular Class	About 15-40	Self Learning + Assisted by Faculty in between	3
	About 300	Self Learning + Assisted by Faculty in between	1

Table 4. *Results of the Questionnair-1*

	Yes	No	(None)
Q. Did you use LMS for your classes before?	4	4	
Q. Is it easy for you to understand how to manage the course material?	7	1	
Q. Do you think the course material can be useful to your class?	8	0	
Q. Do you think the learning outcomes can give influence to his/ her other study?	6	1	1
Q. Do you recommend others to use this material?	6	1	1

(N=8)

Table 5. *Results of the Questionnair-2*

Q. Are you running the material with no trouble?	2.43
Q. Is there any problem in the contents or structure of the material?	3.29
Q. Do students realize how to learn with this?	2.29
Q. Is it going along with your plan?	2.43
Q. Do you worry about any future trouble for the rest of the semester?	2.71
Q. Assistance from support staff: Is the information enough for you?	3.29
Q. Assistance from support staff: Is the support enough for you?	4.14

Q. Tell us what you noticed.
- I am having trouble because the speed of each student's study is getting different.
- I don't understand well enough to know my own role in the management.
- I need to arrange for integrating this material and my class.
- I am having hard times to have students work on this.
- The contents of the material will be a little difficult for my students.
- In the future, it is better to arrange for providing another version of this material which should be divided into some parts, so that it will make faculty easier to integrate with his/her class.

Note: The numbers above are averages (maximum 5.00) for each question rated by faculty from one to five. (N=7)

However, the results of Questionnaire-2 must be carefully analyzed. The results indicate that some faculty members were having difficulty in managing the course material. Some were worried about the rest of the semester, although they felt that the assistance received from e-learning support staff was adequate. This suggests that actions in relation to Factor C (Confidence) from the ARCS+AT Model are not enough. In other words, we may be able to improve the situation by taking appropriate actions related to factor C from now. We will suggest that the e-learning support staff prepare a new hint list for faculty and students and that it should be released before this semester ends.

We want to emphasize that the eight faculty members, who identified problems that need to be solved, are the pioneers of e-learning at this university. What they expressed will have a strong influence upon other faculty on the campus. Therefore, the e-learning support staff will incorporate the information on their views into the ARCS+AT Website after the evaluation of the course material. This information, including positive and negative views, will be shared with other faculty on the website and will encourage others to start thinking about e-learning. At the same time, the eight faculty members will revise their classes for the next implementation. Also, they will present at conferences what they have accomplished, which will serve as meaningful information to other faculty visiting the ARCS+AT Website. Through this cycle of activities, all information accumulated will help to promote e-learning at the university (Figure 5).
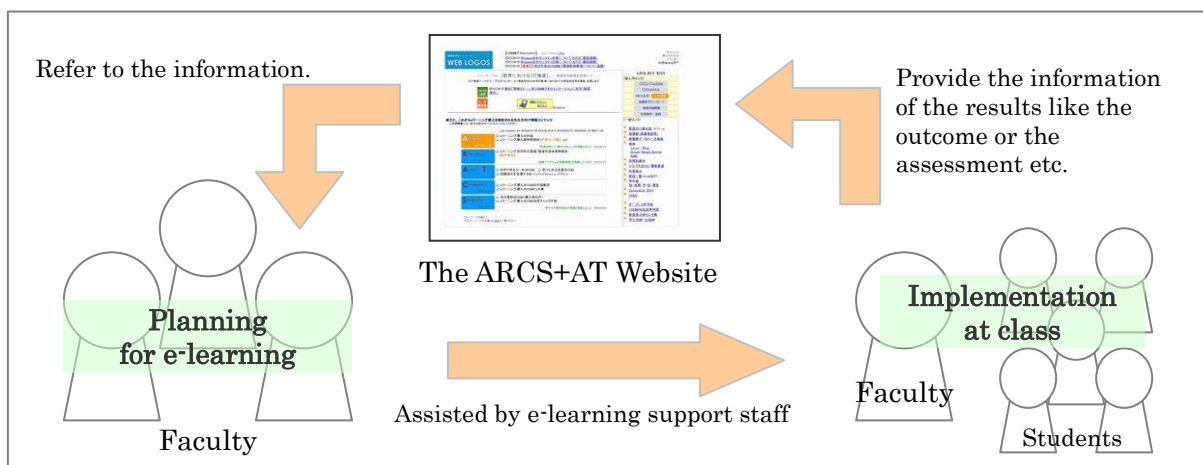

Figure 5. *A Cycle of the Activities*

Discussion

The ARCS+AT Model provided the e-learning support staff at a university with the ARCS+AT checklist, which enabled the staff to check what should been done for motivating faculty to utilize e-learning. The staff reviewed the e-learning environment using the checklist and started creating the website for faculty, called the ARCS+AT Website, to distribute the information on Attention, Relevance, Confidence, Satisfaction and "Assistance and Tools" so that every faculty

member on the campus could access to it and might be motivated by the information. Then e-learning support staff developed the website further through adding the ID based course material, which any faculty could start e-learning without any extra work. Up to this, it is Step 1) described in the Introduction of this paper. As for Step 2), the eight faculty members with their fifteen classes started to use this material in their regular classes. The results from the Questionnaires proved that they were motivated at the beginning of the e-learning but some of them started to feel uneasiness later because they did not have enough confidence to manage the material. Strategies for gaining "Confidence" needs to be taken as described in the above Results and Expected Effects.

An issue left for future research is that data from more faculty members should be gathered and analyzed. Against this issue, it will be useful to share the outcomes from the practice with the FD section at the university to institutionalize the effort. At the same time, students' outcomes from their study must be focused when we further evaluate the effects of this model. It will not be enough to focus just on faculty's motivation. After going over these issues, Step 3) and Step 4) in the Introduction will be taken, step by step. But it is a real fact that e-learning was started at the university by using the ARCS+AT Model. This means that the validity of the ARCS+AT Model to promote e-learning was not disproved although more research is needed. The model must be revised each time the results of the future research suggest it, and will be improved with the theoretical elaboration in the future.

On the other hand, there may be difficulty in applying the model at a university where e-learning support staff has to learn much about ID before practicing the model. They will sometimes have to act a role of the instructional designer. At this point, a system for assisting e-learning support staff might be useful. A framework for this system will require another research work regarding the ARCS+AT Model.

Conclusion

In this study, we presented and discussed the data on the effectiveness of ID based activities for e-learning, derived from the ARCS+AT Model, by describing a project for practicing the model at a university in Osaka. In the future, we will continue the activities and fully evaluate their effectiveness for promoting e-learning. We will strive to improve the quality of the model based activities and demonstrate the model's credibility as well as its general applicability in e-learning environments.

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