An Interactive Learning System in Elementary Schools

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Summary
This paper is to examine interactive integrative learning support system for elementary school students. Our Web-based system enables a group of some 5 students and teachers to learn interactively by collaboratively creating outcome (i.e. Web pages) through a shared Web site. Three main functions of the system are followings: (1) To build a shared Web site directly from Web browser in order to support students and teachers who are inexperienced in composing HTML. (2) To modify and edit a shared Web site directly from portable terminals to support students at on-site training in real time. (3) An agent function that supports plan modifications and rerouting in case of students choose a wrong route. We have applied our system to research training and on-site training of elementary school students who are studying in a group as a part of integrative learning curriculum.

Key words:
Agent-based e-learning support system, Interactive learning, Cooperative learning.

1. Introduction
Importance of integrative learning [4] has been increasing in the field of education. The integrative learning is collaborative learning curriculum of students and teachers that is consisted of off-campus shared task achievements (on-site training) and on-campus researches (research training) [5]. Our research assumes an actual fieldtrip that was planned and implemented as a research training and on-site training respectively.

Existing research training has been implemented by paper-based teamwork where members fill out their plans on a sheet of paper. We are proposing Web-based system which build fieldtrip plan on Web page. However in general, there are few teachers or students who stay on top of Web page building. In order to solve the problem, we have applied direct and easy to operate Web editing technologies.

As far as existing on-site training concerned, students along with paper timetable has been contacting their teachers by cellular phones. By deploying compatible function between cellular phone and Web and by deploying JAVA executable function within cellular phone, we have succeeded creating an agent that supports real time Web communication between teachers and students while multiple students are on a fieldtrip.

The overviews of integrative learning conducted in the research are as follows. Overall fieldtrip plan is drawn at research training phase and then actually implemented at on-site training phase. In the research training phase, teachers and students are required to collaboratively draw time constrained one day fieldtrip plan. After destination, attractions, and transit points are decided, learners verify the transit route by using internet service such as Google. The field trip plan is built on the internet as a shared Web page (Hereinafter referred to as "bookmark"). Learners are free to fill out the bookmark with necessary information needed for the fieldtrip collected from and confirmed by the internet. Information such as train destination and departure time, boarding, transit, and arrival stations are listed in orders. Also, information regarding destination or types of souvenirs sold could be found on the internet and are filled out in the bookmark.

At on-site training, learners behave in accordance with their planned fieldtrip schedule. They can sequentially confirm their transit schedule planned at research training phase by browsing bookmark with PDA or by talking their teachers over a cellular phone. In the case students miss the train, agent within PDA will modify the original plan and propose new one.

The components of this paper are as follows; in chapter 2, supporting mechanisms of research training and on-site training are explained. An example of the system execution is presented in chapter 3 and the system features are presented in chapter 4 and summarized in chapter 5.
2. Interactive integrative learning supporting system

2.1 Investigation training supporting mechanism

As a part of integrative learning supporting system for elementary school students, we proposed educational technique that urges students to make the brochure for an excursion by themselves (research training) and to proceed excursion according to the brochure (on-site training). Using budget train tickets, a group with 5 to 6 students carries out an excursion heading toward their destination and returning back to their starting point. Students are required to find out the route and timetable for their desired destination in advance and to make brochure, which is an itinerary for the excursion. In conventional way, it is a big burden for the teachers to fully review and confirm students' multiple itineraries since it is written on the paper. However, in our system, all itineraries are written through Web page by entering brochure so that teachers can review and confirm the itineraries by Web browsing. The system doesn't require printed brochure brought on the day of excursion as students can browse through portable terminal such as a cellular phone. However, it will take time for teachers to teach students how to make Web page since only few of them know how to do so. In our research, we focused on research training in interactive integrative learning.

As a WFE, application, we have built a brochure creating supporting system that is used for preparation of on-site training. Entry of the itinerary by students (figure 1-1) and entry of comments by teachers are required when creating Web brochure. If we spend much of the time for Web page, the efficiency of research training will decline since both students and teachers are inexperienced. We developed brochure creating system using WFE (figure 1-A) which eliminated the lecture of FTP or HTML authoring software. As the result, teachers can devote their time to research training.

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![Figure 1: Investigation training supporting mechanism](image)

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Teachers are required to comment on the students' brochure whether they're appropriate. Because of the structure, HTML can only handle texts and the inserted comments require flexibilities as if they were written on the papers. We have developed Home Page Sticky (Hereinafter referred to as HPS), a Web comment attaching system that enables to attach word balloon shaped notes on Web pages (figure 1-B). Attached notes can be viewed by other users so students can edit their itineraries. Since research training equivalent to conventional approach is available anytime, HPS makes research training efficient.

An agent allocated to each brochure plans route using route databases on the internet. If there is a Web browser, efficient research training is possible for both students and teachers. All students are able to view other's Web page so that mutual corporation between learners is possible by referring others or pointing out. A shared Web page which acts as a brochure is built by using MiLog [3], a mobile agent entry environment, as a Web server. MiLog is an environment that builds mobile agents and each agent travels between computers while functioning as a Web server. The mechanism of the system supports on-site training learners by providing an agent per one brochure.

![Figure 2: On-site training supporting mechanism](image)

Figure 2: On-site training supporting mechanism
2.2 On-site training supporting mechanism

On-site training supporting mechanism is shown in figure 2. Each group communicates with teachers by portable terminals and agents support students' decision based on brochure in real time. The brochures made at research training phase can be shown on portable terminals and pictures can be pasted to the brochure via portable terminals using HPS architecture. Students can keep the records of on-site training in real time by actively reconstructing the brochures.

The agents are stored in the server and roughly tracking students' current location by GPS function in students' portable terminal. Alert will be sent to students from agent if the time and place in the brochure widely differ from current location so that teachers can give appropriate directions to students.

3. An executive example

An executive example of corporative brochure work directly from Web browser using WFE architecture is shown in figure 3. Transit planning of the train based on timetable is used as the example. Teachers prepare basic template in brochure in advance and students are to edit it if necessary. Selection of member field in brochure to add member to the group is shown in figure 3. Editing screen is shown in figure 4 where member had actually been added to the group.

Figure 3: Collaborative brochure work using WFE architecture

An example of confirmation from portable terminal at on-site training is shown in figure 5. In the example, transit of train in fieldtrip plan is fit to shown on portable terminal's small screen.

The real time comment of the teacher to the students' brochure can be reflect on the web pages using our system. Label that has a shape of word balloon is pasted to Web page and students are able to view it from portable terminal or computer.

4. Features

The features of the system are shown in (1) to (3).

(1) At on-site training, it's essentially important for the students to build brochures freely with the interaction with the teachers. To learn HTML grammar or FTP operation to make brochures is not essentially important. By introducing WFE and HPS architectures, we have enabled students and teachers who are inexperienced HTML composition to build a shared Web site directly from Web browser.

(2) The system can modify and edit Web pages directly from portable terminal to support on-site training in real time. Contrary, it is difficult to reflect the pictures taken by students at outside to the brochure in traditional on-site training since the brochures are made of papers.

(3) The system has the agent function that support plan modification and rerouting. In the case students take wrong route or emergency where teachers need to provide appropriate advice, the agent in the system revises original plan and proposes alternative route if the situation is simple. To realize much
safer on-site training, alerts will be sent from the agent to both students and teachers if the case is complicated.

Figure 5: Browsing on-site training brochure

5. Conclusion

In our research, we have proposed research training supporting mechanism and on-site training supporting mechanism to develop research training and on-site training efficiently in integrative learning. By introducing WFE and HPS architectures, research training supporting mechanism enabled students and teachers who are unfamiliar to HTML or FTP to easily revise and edit Web pages. On-site training supporting mechanism enables real time reconstruction of brochure via portable terminal and real time modification of fieldtrip plan by agent function. By introducing the system, we have confirmed dramatic reduction of learner's burden of research training assignment as well as efficient and smooth development of on-site training from research training. We can expect the promotion of educational effect by introducing the system.

Many e-learning systems have been developed in the past years [6] but most of the recent systems [1] are lecturing type system represented by Web-based Training (WBT) and remote education. Not only has the importance of lecturing but on-site training been confirmed in recent educational reforms [4]. On-site training is interactive activity between problem finding and solving involving five senses. Also, on-site training is the learning method to obtain facts, laws, and social functions through the activity. The decline in social contacts and insufficient personal development of learners explains the growing importance of on-site training. In addition to traditional lecturing approach, our system supports fieldwork type on-site training.

References

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