Special Education Teachers' Attitude toward the IEP-integrated Resource Room e-Learning System

Tung-Kuang Wu[1]

tkwu@mis.must.edu.tw

Shih-Chang Tsai[2]

Jacktsai@yahoo.com.tw

Ying-Ru Meng[1]

myr321@mail.nhctc.edu.tw

Tung-Hsin Su[1]

thsu@mis.must.edu.tw

Sen-Ren Jang[1]

srchan@mis.must.edu.tw

[1]*Dept. of Information Management, Minghsin University of Science & Technology*
[2]*Dept. of Special Education, National HsinChu Teachers College*

Abstract

Researches have shown that students receiving special education can potentially benefit through the use of multimedia courseware. However, traditional Internet-based multimedia web sites or e-Learning systems usually suffer from the problem of long transmission latency. On the other hand, multimedia contents that install and present in local computer usually lack of the capabilities of adapting to users with different characteristics. The Resource Room Learning Management System" (LMS) was proposed to overcome the dilemma. The idea is to distribute and operate the LMS in Resource Room's LAN environment so that the multimedia contents can be accessed with less delay. Multimedia contents are then shared and exchanged through a centralized repository. The LMS system adopted is SCORM-compliant in order to facilitate contents sharing and management. It is easy to install and manage so that it would not impose too much extra burden onto resource room teachers. It is adaptive so that it would be easily configured or modified to fit into versatile resource room environments. In addition, efforts have also been working on integrating a computerized IEP (Individualized Educational Program) system that we developed separately. Such an IEP-embedded LMS can customize itself to fit each individual student's unique learning requirements. A prototype of such system was first released on late 2003. Since then, we have been improving the system and given a number of demonstrations to special education teachers in several occasions. Currently, it is also under small-scale field testing.

The purposes of this paper are to report the current status of the system and special education teachers' responses we have received so far on this system.

Keywords: IEP, Learning Disabilities, Special Education, e-Learning, SCORM.

1. Introduction

For the past two decades, the progress of the Special Education in Taiwan was facing three major difficulties, which are (1) shortage of qualified teachers [4][7], (2) lack in resources (space and funding) [9] and (3) discrepancy between city and rural area (in terms of space, funding and special education specialists) [9]. These three issues are correlated and results to the consequence that some students need to receive special education are not admitted.

The problem of teacher shortage has been somewhat relieved due to the policy of the MOE (Ministry of Education). However, quantity does not necessarily guarantee quality. By that we do not mean to question the quality of special education teachers, but the efforts they could devote to students, considering the workload that they are having in current system. As we know that individuals receiving special education diversify in every aspects of their learning and development process. As a result, individualized instruction has been one of the major characteristics in special education [12]. Since there is no common teaching material that fits all special education students, teachers usually have to develop courseware specific to each student (at various grades) of their own. This imposes extra workload to most special education teachers in addition to lots of paper work, such as writing IEP (Individualized Educational Program) as required by law [12][14], filling up different kinds of administratively regulated forms, etc. Some of the special education teachers would seek any opportunity to transfer to other teaching position [7]. The others plagued with seemingly endless paper work, with limited time left for actual instructional activities [13]. In addition, lack in space and funding, which means each special education resource room needs to accommodate more students, has made the problem worse [13]. And the situation is even worse in rural area, where most of the schools do not have any resource room [13].

As a result, students that are qualified for receiving special education are either rejected due to limited resources or end up in a crowded resource room. The ideal so-called individualized instruction that these students deserved are sometimes sadly compromised. Unfortunately, help from commercial vendors (either courseware or software vendors) is not going to happen in any foreseeable future as the limited market size in special education would not justify their investment. Funding and resource that is enough to overturn Taiwan's current special education status in a short period of time is not likely, either.

On the other hand, there is good news, too. The accelerated evolutions of information technologies provide a potential solution to the special education difficulties that we mentioned above. They can help special education in the following ways: (1) the Internet can act as a repository for the self-developed courseware and help the sharing of such courseware among special education teachers, (2) specially designed computer applications can relieve most of the special education teachers' routine paper work, (3) custom-made multimedia courseware can assist the instruction or learning of special education students.

In this paper, we will first briefly explain how information technologies can help special education and the efforts that we have been done in this field. Section 3 will give an overview of the IEP-integrated resource room LMS system that we proposed, followed by the special education teachers' opinions toward such system. Section 5 gives a brief summary and a list of issues that require further research.

Also note that the term "special education students" used in this paper mainly refers to students with non-physical disabilities, such as mild or median metal retard, learning disabilities, attention deficit hyperactive disorder (ADHD), severe emotional disorder (SED) and autism. These groups of students constitute the major portion of all students that are receiving special education [20], and usually have no problem accessing computers. In current Taiwan's special education system, students diagnosed with disabilities of these categories are usually admitted to the so called "resource room", which provides necessary resources (may include special education teachers, special environment setup, etc) to help students overcome their disabilities and eventually return back to their original classes [13].

2. Special Education & Information Technologies

Research results have shown that multimedia-based computer assisted instruction (CAI) can improve special education students' academic performance [1][2][3][5][6][8][10][11]. In addition, CAI can relieve a little of instructors' teaching load, too. Information technologies are also widely used to assist special teachers in processing their routine work [18].

For the past few years, we have been devoting a lot of efforts to this area. We have conducted a three-year project funded by National Science Council to develop a computerized IEP system. This computerized IEP system has been released and tested by over 1400 resource room teachers, and is currently adopted by approximately 200 schools. Response from special education teachers shows that this computerized IEP can save considerable time so that they could put more efforts on instructing their students [16][18]. Researches have also been conducted to experiment different instructional strategies for students with learning disabilities (LD), attention deficit hyperactive disorder (ADHD), severe emotional disorder (SED) and autism. We then develop special education courseware at the Primary level base on these proven teaching strategies. More than 20 units of courseware are developed per year, primarily in Mathematics, Chinese, English, Social skills and Learning Strategies. (http://teachers.dale.nhctc.edu.tw/resource/). Finally, a multimedia-based learning website (http://kids.dale.nhctc.edu.tw/) designed mainly for students with learning disabilities and ADHD was established. It is basically a multimedia version of courseware that we designed, plus tools that allow students to communicate to each other on line. For years, we have seen many resource room teachers use the multimedia courseware we designed to assist their teaching, and were hoping that we could eventually build a "learning system" for special education students.

However, the courseware (whether they are multimedia or not) are still not enough to cover all materials and are thus used as a demonstration to the special education teachers, rather than solving their problems. In addition, the maintaining of the multimedia website is becoming more and more difficult as it requires a lot of efforts in putting together contents designed with diversified styles and different technologies. Sometimes we also receive complaints from teachers and students regarding to the long transmission delay of the multimedia contents. It becomes apparent that we alone cannot achieve the goal of building the so-called "learning system". Some kind of mechanism is required to include most (if not all) of the special education teachers to the pool of designing and authoring of courseware. And the problem in the delay of Internet-based multimedia contents delivery should also be overcome.

Fortunately, recent development in e-learning standards provides a potential foundation in helping out the difficult situation that we (and special education in general) are facing with. Among various e-learning standards, SCORM (Sharable Content Object Reference Model) is the one that receives the

most attention [22]. SCORM is part of a U.S. Department of Defense strategy called the Advanced Distributed Learning (ADL) initiative. The ADL initiative was established in 1997 to standardize and modernize the way in which training and education are delivered, by maximizing technology-based learning to generate substantial costs saving. SCORM-compliant courses leverage course development investments by ensuring that compliant courses are Reusable, Accessible, Interoperable, and Durable [21].

However, even though many e-Learning institutes have chosen to adopt SCORM. We have also seen a lot of research activities in the field of e-learning (that base on SCORM) and its applications to higher education and corporate training, with a few exception [23], there seem not many attentions addressing to the applications in the primary level [15], and virtually none in special education. (By e-Learning, we are not referring to conventional web-based or distant learning, but one that is built upon standard like SCORM.)

As we stated in previous sections, special education students' versatile learning characteristics usually translate to customized courseware and individualized instruction, which impose a major burden to the special education teachers. In this case, SCORM and the content-sharing idea behind it may provide the foundation for contents exchange, which would relieve the special education teachers from developing required courseware all by themselves.

In addition, special education teachers probably "know" their students better than any other teachers do. According to the Special Education Act, an individual education program (IEP) must be designed for each student receiving special education. An IEP give details about the educational supports and services that will help the child with a disability (or disabilities) receive valuable instruction in special education. New regulations emphasize that the IEP team must consider a student's strengths as well as areas of weakness when formulating an educational plan. With the knowledge embedded in each individual student's IEP, the LMS system may be customized to deliver contents that fit each special education student's unique learning requirements and become a "semi-intelligent" individualized learning system.

The above observations made us believe that combination of these recent e-learning related standards and technologies is one of the most promising solutions to the difficulties in special education. With the belief in mind, we proposed the IEP-integrated Resource Room Learning Management System (Figure 1) [17]. It consists of an Internet accessible multimedia contents repository and the LAN-based learning management system. The idea is to distribute the Internet-based website to each individual resource room so that multimedia contents are delivered through a local area network instead of the Internet. This would reduce transmission delay considerably, while still preserving the capabilities of maintaining users' learning activities. The IEP of each student provides information to the LMS so that it can organize and adapt the sequence of contents delivery to each distinct special education student. By adopting SCORM standard, courseware (or in SCORM's term, learning objects and content aggregations) can be designed and developed independently, and later aggregated or imported to any SCORM-compliant LMS. This not only eases the maintenance efforts require to run the multimedia website, but also improves the contents sharing if the granularity of learning objects is properly defined.

A prototype system was developed based on the above idea. The following section will give a somewhat more detailed overview.
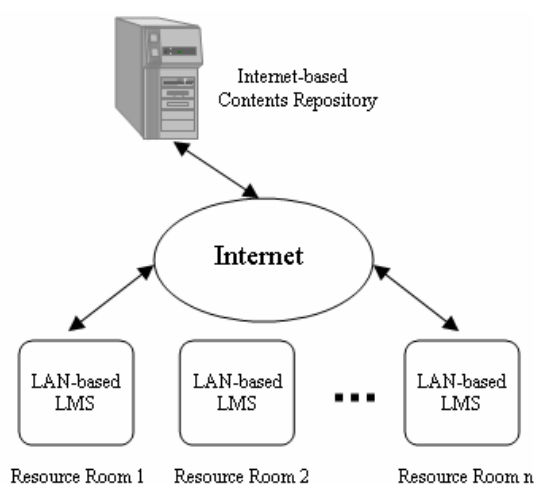

Figure 1. Architecture of the Resource Room Learning Management System

3. System Overview

The Internet accessible multimedia contents repository is currently a plain FTP-enabled website and will be later replaced by a learning contents management system (LCMS). As to the LAN-based LMS, since it is to be installed in special education resource rooms and managed by special education teachers, a number of requirements need to be met. The LMS should be compact, easy to install and manage. It is compact so that it would be easily adapted to the versatile resource room environments and students. It is easy to install and manage so that it would not impose too much burden onto resource room teachers.

Our LMS implementation is based on the sample run-time environment (sample RTE 1.2) by the ADL (Advanced Distributed Learning). The ADL sample RTE was chosen not just because it meets our requirements, but it helps us fast-prototyping our idea

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so that we can gain more experience and collect valuable response upfront. The ADL sample RTE was localized and a few code representation issues and bugs were fixed.

We also added a number of new features that were requested by special education teachers [19]. For example, the administrator (in this case, resource room teacher) can alter the content delivery sequence on a per user basis. This provides an alternative solution before IEP and LMS can be fully integrated. In addition, the administrator also has the option to set the number of times that a particular course can be repeated with respect to each user, so that user needs not to re-register to the same course once he/she finished it. This is essential to many special education students, who usually need to review the courseware many times in order to catch the idea.

The revised version of sample RTE was then re-packaged so that special education teachers can install, manage & initiate the LMS system in a very easy and straightforward way. In fact, all the users need to do is clicking the "next" button (see Figure 2). The LMS system would be ready to operate in about 5~10 minutes with all the issues, which include database connectivity configuration, being taken care of. More detailed descriptions of the operations and screen captures can be seen in [19].

Figure 2 Installation of the LAN-based LMS

The contents in the Internet-based contents repository consist of mainly SCORM-ized multimedia contents that are originally located in the For Kids website. We also provide tools, which is embedded in our computerized IEP system, to assist special education teachers in packaging their self-designed courseware to SCORM format [19].

The computerized IEP system that we developed separately has also been integrated to the LMS system. There are three potential aspects that a LMS can benefit from a well-written IEP, which include (1) the demographics information in IEP can be directly imported to the LMS so that time can be saved in student's registration, (2) the learning steps customized for a particular student can be used to change the course units (or the learning objects in

SCORM term) delivery sequence to meet specific student's learning needs, (3) the learning characteristics, strengths and weakness of each student as evaluated by the special education teacher can be embedded into the LMS to form a "semi-intelligent" learning system.

The first two items involved only the information integration aspect and have been completed. The third goal is still under close investigation by a team that consists of special education specialists, teachers and computer scientists. This task is a little complicated and takes more time as it involves the transformation of somewhat abstract characteristics to concrete information that can be utilized by computer programs. As a result, a further classification of various disability types/patterns and their characteristics, together with adequate instruction strategies is required.

4. Special Education Teachers' Response toward e-Learning

The proposed IEP-integrated Resource Room Learning Management System was first released and introduced to a group of 141 teachers (mainly in the special education field) on late 2003. The idea and goals behind SCORM (such as learning objects and courseware reusability) and e-Learning are also addressed to the audiences. Questionnaires are then given to the attendees in order to collect their opinions. A hundred and thirty-six copies of questionnaire (out of 141) are returned, with 2 of them being declared invalid.

Table 1. Information collected from previous national survey (2002)

Background	Percentage
Teachers of female gender	77.9%
Teachers with College Degree	81.8%
Teachers graduated from 4-year Special Education Dept.	40.3%
Teachers from school with more than 25 classrooms	69.6%
Teachers with Special Education teaching experience between 1 and 5 years	74.5%

Among all the subjects, (1) 79.1% of them are female, (2) mostly age between 21-30 (50.0%) and 31-40 (33.6), (3) 77.6% and 20.1% of them have college or graduate degree, (4) 40.4% graduated from 4-year special education department, (5) 63.4% and 31.3% of them are elementary or junior high school teachers, (6) 67.9% of them currently working on schools with more than 25 classrooms, (7) 62.7% of them come from northern Taiwan area, (8) 34.3% and 27.6% of them have less than 3 years or between 3 and 6 years special education experience. These

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background statistics (except (7)) are very close to our previous national survey [18], as reorganized in Table 1.

There are six questions in the questionnaire (one of them is an open question, which will not included in the following discussion) in addition to some background information that we considered necessary. These five questions are listed as follow.

(1) Do you think it is helpful if a SCORM-compliant Learning Management System is available for use?

(2) Do you think it is helpful if some kind of courseware sharing and feedback mechanism is established among the special education community?

(3) Do you think it is useful if courseware development guidelines are defined and courseware representation is standardized in order to facilitate courseware reuse?

(4) Do you think it is useful if the learning characteristics within student's IEP are embedded into the LMS so that it can adjust its actions with respect to various students accordingly?

(5) Do you think it is useful if "learning step" within student's IEP is integrated into the learning system in order to govern the learning objects (SCOs) presentation sequence?

Table 2. Teachers' attitude towards e-Learning

Question	Very helpful	Helpful	A little helpful	Not helpful
(1)	55 (41.0%)	74 (55.2%)	5 (3.7%)	0 (0%)
(2)	68 (50.7%)	63 (47.0%)	3 (2.2%)	0 (0%)
(3)	68 (50.7%)	61 (45.5%)	5 (3.7%)	0 (0%)
(4)	56 (41.8%)	74 (55.2%)	4 (3.0%)	0 (0%)
(5)	68 (50.7%)	62 (46.3%)	4 (3.0%)	0 (0%)

Table 2 shows the overall response of the five questions. It is apparent that most teachers thought positively about e-Learning, SCORM or idea that behind them. Comparatively, teachers seem to be more concerned about contents (such as courseware sharing in Question 2, courseware reuse in Question 3 and contents presentation sequence in Question 5) than information system that can potentially assist their work (such as LMS in Question 1 and "smart" LMS in Question 4).

An in-depth analysis (as shown in Table 3) shows that teachers from school with more than twenty-five classrooms or teachers with special education teaching experience less than six years are "significantly" more positive (answer "very helpful") regarding to Question 2. In addition, teachers of

female gender, college or 4-year special education department graduate are also "significantly" more positive regarding to Question 5. How and why teachers' gender, educational background or special education experience affect their response may require further investigation. However, base on the results in our previous national survey (as shown in Table 1), these groups of teachers represent the main stream first line special education task force in the primary and secondary level. Their opinions reflect the two potentially most wanted features (or goals to achieve) of future e-Learning development in the field of special education, which are also our current research priority.

Table 3. Special education teachers' background information and their tendency in answering "very helpful" to various questions

Question / Background	(1)	(2)	(3)	(4)	(5)
Female					0.019*
College Degree					0.041*
4-year Spec. Ed. graduate					0.038*
Serve at school with more than 25 classrooms		0.047*			
Less than 6-year Special Ed. experience		0.007*			

* : P<.05

5. Summary & Discussion

In this paper, we report the current status of our proposed resource room e-Learning system that combines the computerized IEP system we developed and a SCORM-compliant LMS. Special education is one of the fields that do not receive enough attentions in the SCORM-based e-Learning research community. However, we believe e-Learning related standards and technologies are among of the most promising solutions to the difficulties in special education. Our study shows that special education teachers feel in the similar way as we do. Among all the potential benefits that e-Learning can bring to the special education community, the idea of contents sharing / reuse and the possibility of building a semi-intelligent learning system by integrating IEP and LMS are the most anticipated ones. Our current research efforts are also basing on these findings. They include:

(1) Define domain ontology (in particular, of the learning disabilities field in the primary and secondary level) so that teachers have the same view of the classification tree in learning objectives. This would also standardize contents description and facilitate contents sharing since contents providers and users are using the same

schema. Better yet, the instruction plan (which usually contains one or more learning objectives to achieve) within an IEP can use the same ontology so that instruction planning and courseware design can be tightly matched.

(2) Develop effective guidelines or methodology in designing learning objects and partitioning courseware to learning objects with adequate grain-size for better reusability. New instructional strategies base on learning objects would also be explored.

(3) Work out some kind of rewarding mechanisms or system so that special education teachers are willing to share their self-designed contents among the community.

(4) Build a mapping between teachers' commonly used terms in describing student characteristics and corresponding instructional strategies of various disability patterns. The mapping will help the transformation of abstract characteristics (described in the IEP) to concrete information that can be utilized by computer programs (the LMS).

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