Software Development for Memorandum Report System in Monitoring Students

Anon Sukstrienwong

***Abstract*—** Nowadays, most teachers encounter the problem that students cause more troubles in school related to the behavior of students. As it is involved in the development of skills and ability to learnt, there are many computer systems implemented to solve this problem and ensure that students will behave well and study efficiently. However, in Thailand, there are few computer and information systems implemented for school attendance at schools. Therefore, a case study of memorandum report system is developed to help teachers for monitoring student behaviors in school. This system is capable of holding daily school attendance and behavior of each student that may harm learning skills. The system called the Memorandum Report System (MRS) was deployed for Bangban School as a case study. It has revealed some important information for monitoring students in school. The software evaluation of satisfaction and efficiency of the system indicated that our system works efficiently and supports all of school's requirements.

***Keywords*—** Software design, Software development, Student monitoring system, Student behavior.

I. Introduction

SEVERALresearch papers worldwide are working now on adaptive web-based applications driven by the importance of web-based education [1], as we can see in [2],[3]. However, in contemporary education, we still need to monitor student's behavior, as it helps teachers to know where their students are and to respond in a timely way if a student is placed incorrectly or is not progressing in learning. Performance Measurement has been largely dependent on students' performance in carrying out tasks such as tests, quizzes or submission of assignments [4]. In a regular classroom, teachers can simply track student's attendance and activity to find students who need special attention [5]. Additionally, it is helpful for teachers in schools to identify which students can demonstrate proficiency on state content standards. Therefore, teachers are to continuously monitor students as part of their classroom instruction. Nowadays, the importance of monitoring and evaluating students has become an important issue. Evaluation can, and should, be used as an ongoing process and learning tool to improve student skills. At the end of semester, many teachers think of student evaluation as taking a snapshot of outcomes to prove that teaching worked or failed. Well organized and effective computer programs in school can give the required results. Various applications can be developed with the aim of analyzing students' performance more effective by tracking student grades. There have been several tools to support the notion that we need to monitor student performance, such as in [6], [7], [8], [9]. Reference in [7] studied software to monitor students for instructor to obtain better feedback about what the students have learned. It can be seen in [8], [9] and [10] that all of them have implemented web-based student information systems, which are helpful for instructors to evaluate student performance in real-time. Many school systems require assistance in building a student attendance database to lead to educational improvement [11]. There are some evidences that many parents are concerned about education attendance rates [12], [13]. There are clear benefits for students to be gained in attendance [14]. Furthermore, if students do not attend the school, there cannot be educational improvements [15]. Accordingly, there is a need of computer systems to track students' attendance and behavior. In a Web-based classroom, the teacher in the best case has only logging data - tables with numbers which are very hard to grasp. At the same time, the need to identify a small subset of students who need help more than others is more important.

In order to track student attendance, several schools have applied a scanning card system, which is a rapid and reliable tool that can prevent human error. In [14], the application of active RFID in a student monitoring system is to improve faculty management and to monitor particular group of students. In our case study, the system called Memorandum Report System (MRS), as it helps recoding each student's behavior and generating reports of school's year in Bangban School[1]. It was first designed in the academic year of 2011. The number of students was approximately 465. Our developed system software uses bar code readers as well to record what time students have come to school. By scanning student cards, teachers can monitor student attendance to build an early picture of student behavior. The system can be utilized to record risk actions caused by students.

There are eight parts to our paper including this introduction. The purpose of the research including the users of MRS is shown in Section 2. The research instrument and computer hardware are described in Section 3. Use case diagram and its database are depicted in Section 4. The network design is shown briefly in Section 5. The performance development is in Section 6. The evaluation of satisfaction is

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A.S. Author is with the Information Technology Department, School of Science and Technology, Bangkok University, Bangkok, Thailand (e-mail: anon.su@bu.ac.th).

[1] It is located in Ayutthaya province, the middle part of Thailand.

provided in Section 7. Conclusions are provided in the last section.

II. The Purpose of the Research

The users of our MRS can be classified into two groups, teachers and all students of Bangban School from grade 1 to 12. During the first academic year of 2011, the number of students was about 465 students. The main purpose of this paper is to develop a computer program that facilitates teachers to monitor student's behavior in school and helps tracking and recording risk actions caused by students. The purpose of our research can be classified as following:

1. To develop a system that enables teachers to record the school attendance of students easily. In addition, it is able to facilitate students to record the checking in time.
2. The developed system meets the needs of teachers in monitoring and determining the risk of negative behavior of students in the classroom by providing supports as follows:
   - To help teacher identify students with serious problem behavior that need an urgent individualized behavior support.
   - To help teacher record student behavior that could cause harm to their learning in school.
   - To help teacher identify the student names in the classroom.
   - To help teacher analyze and detect student problems by determining the scores and grades added into the system.
   - To facilitate administrative teachers to contact parents of the students who have been classified in 'risk-behavior' status.

III. Research Instruments

There are several methods that can be used to collect objective and other requirements. Some of the methods are checklist, interview, survey and brainstorming [17], [18]. Due to several important factors, such as the objectives of the research and the requirement of the teachers in school, we used an interview (Interview Form) to gain information from teachers and students. The Interview Form helps us to derive the information that will lead us to develop the MRS system efficiently. After analyzing and deriving the users' requirements, the stage of system design and implementation will take place. MRS is a window-platform application, which is implemented by C# language. In addition, the major database of teachers and students corresponding to their behavior and time attendance is managed by the Microsoft SQL Server 2005. A system database has been designed to support the growth and volume of information in the future. After deploying the trial version of MRS at the school, it will provide a more meaningful understanding of the database, with the purpose of improving performance further.

A. Hardware for MRS

1) Server

The server of MRS stores the database of student and teacher. It is very important and sensitive. Thus, we kept it in a separated room called the "Server room". The brief design of our network is shown in Fig. 3. The server specification is described below:

- Personal computer with Intel (R) D CPU 2.80 GHz, 4 GB of RAM, 200 GB of hard drive
- Monitor 21"

2) Client

- Personal computer with Pentium® 1.80 GHz, Ram 2 GB, 80 GB of hard dive
- Monitor 17"
- MS7120 Desktop Barcode Reader, with the following features.
  - Reading Speed 1200 lines/sec
  - Connect the computer with a USB port, which is easy to use, just Plug and Play.
  - Automatically bar code reader.
  - Size 10.2x10.5x15.0 cm
  - Weight 0.4 Kg.

B. Implemented Software for MRS

To implement the software for MRS, the following applications are used.

- Microsoft Windows Server 2008
- Microsoft SQL Server 2005
- Microsoft Visual Studio 2008 (C#.NET)

IV. Use Case Diagram and Database

The requirements in MRS are modeled by a use case diagram. MRS consists of three packages, which are student package, teacher package, and admin package. The use case diagram of our system is demonstrated in Fig.1. As it is the top-level diagram, it gives a short informal description of the basic processes to see what the system consists of. It so shows three actors that interact with the system. After the administration has created student's accounts and authorized teachers. Students will record their time attendance daily. While both administration and teachers will be able to record unsuitable behaviors of each student that may harm learning skill. The basic criteria for monitoring students are created by the administration. The following figure, Fig.2, is an entity-relationship (ER) diagram; which depicts the rough design of the database for students and their time attendance. It illustrates the relationships between entities in our database.

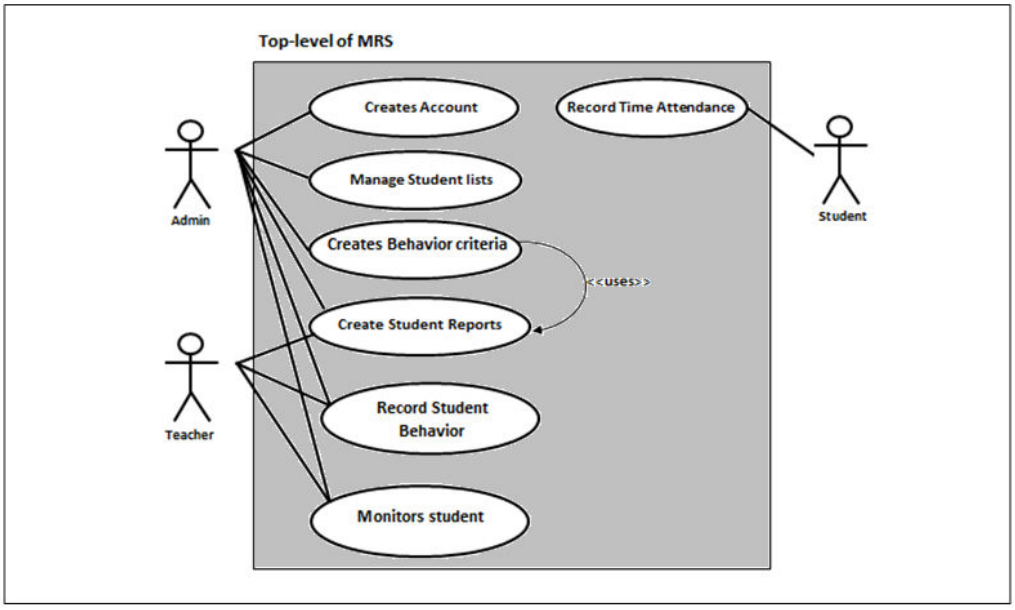

Fig. 1 A use case diagram for MRS system

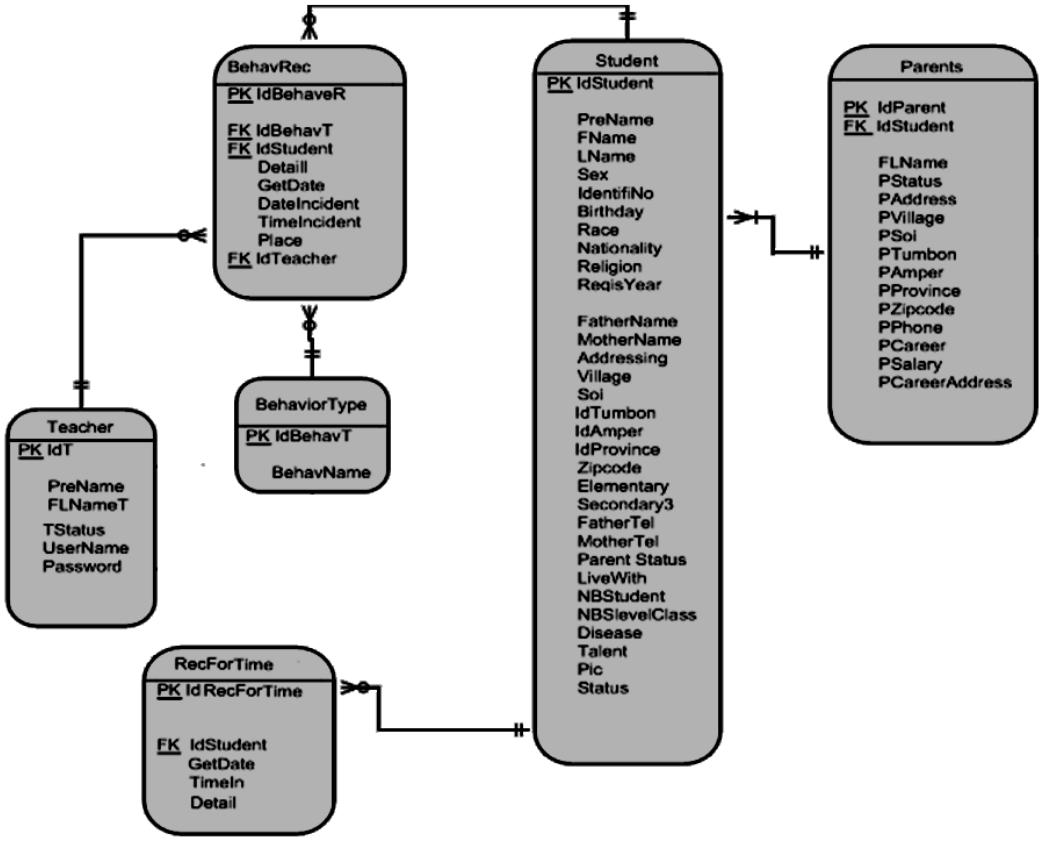

Fig. 2 An entity-relationship (ER) diagram

V. Network Designing

As demonstrated in Fig. 3, connecting devices is switches/router. Switch is used because a hub has few ports and if a system wants to connect several classrooms to a hub, a hub becomes inefficient. So a switch is used to connect a number of devices, which is then connected to one of the ports of the hub.

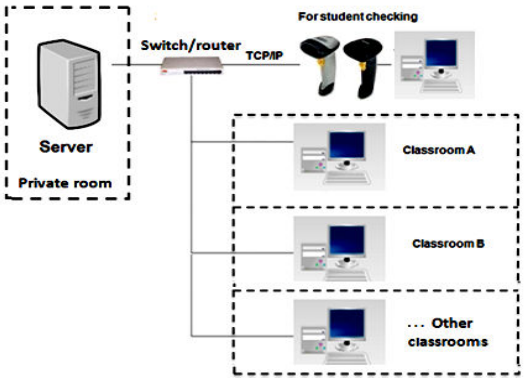

Fig. 3 Network design for MRS

VI. Performance Development

MRS performance can be divided into three parts:

1. For students: When students come to school, they are required to use their identification card to record their school attendance into a school database. They have to do the recording twice a day; in the morning before classes begin and after classes at the end of the day. The designed interface is illustrated in Fig. 4.
2. For the administrative staffs: As the number of students and teachers are large, the administrative user is required to manage the student list and teachers in the school. The administrative user is necessary to log in to access the system. The interface of the system administrator is shown in Fig. 5.
3. For teachers: One of the major things that the MRS requires is to facilitate teachers to check the student attendance in classrooms. Moreover, teachers are able to record significant behaviors of each student that could harm the learning quality of the students in the future. The system is able to create various reports of students' behavior for teachers to monitor their students during the semester. Teachers can add more risk behaviors to the system. As shown in Fig. 6, the five initial behaviors provided in the system are the behaviors associated with; sexual problems, drug addiction, gambling, stolen goods, and not attending school without prior parent permission.

Fig. 4 The UI for students to record the time attendance at school

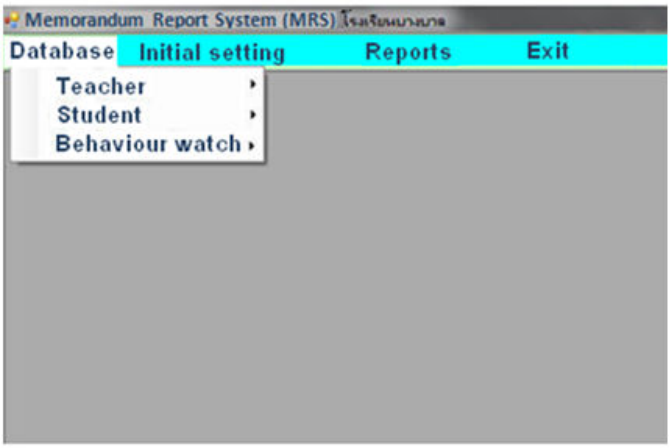

Fig. 5 The UI for administrative staff

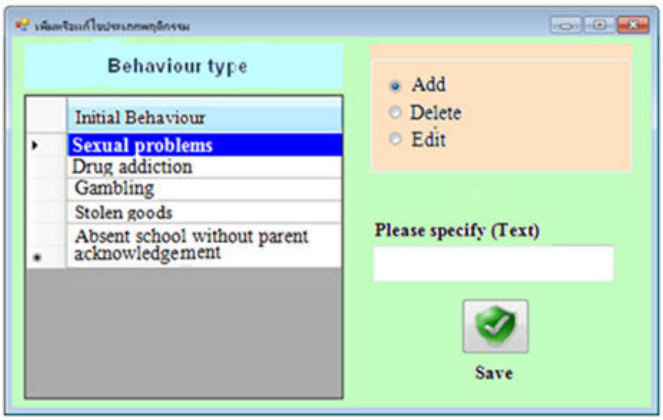

Fig. 6 Five initial student behaviors provided by the system

VII. Evaluation of User Satisfaction of MRS

In the 1st semester of 2011, the MRS was first initiated in Bangban School. Then, the completed system of MRS was completely deployed in the 2nd semester. During this academic year, the evaluation of user's satisfaction was provided to see how well the MRS worked. Evaluation of satisfaction from teachers and students who have used the system are fairly good with an average score of 4.44 out of 5. The results show that our developed software for MRS is satisfactory. The details of evaluation are divided into four areas as follows:

1. Functional Requirement: It is the evaluation of the functional needs of the users, teachers and students. It turns out that the system can fully meet the requirements (score 4.46).
   - Administrative staff can manage the teacher and student list without complexity.
   - The ability of the system to record daily student attendance is good.
   - The ability of system in recoding the students' behavior is easy. Teachers can record, review, and print out the summarized reports to evaluate student behavior in the classroom. The ability to prepare reports for school in order to track the behavior of students is good. The report outlines the history of inappropriate behavior of students so that teachers are able to resolve any student behavior issues immediately.
   - The system allows an administrator to set the basic configuration such as the time required for daily attendance, which are 8.00 in the morning and 16.00 in the afternoon. Moreover, the maximum number of serious behaviors or risk action can be set to change student's status from normal to irregular status. As be seen in Fig. 9, authority teachers are able to change the specific time of daily attendance and the maximum number of time in coming to school after the specific time.

2. Functional Test: In the evaluation of the efficiency of the system, it turns out that the results are satisfactory. Teachers and administrative staffs can track individual student behaviors, or the required group of students. The various functions of the program work quite well. The program has a good ability to make statistical reports in tabular forms, which are easy for teachers to review and understand, see the example of time attendance report in Fig. 7 (score 4.02).

3. Usability Test: After the trial of MRS in Bangban School, we have found some errors. After the first semester of 2011, we were able to fix the error and complete the system better in 2nd semester of 2011. The final version has finished in the second semester, therefore it has been improved to cover the needs of all users (score 4.51).

4. Security test: A server is an important data storage system. Thus, we put it in a separated room called the "Server room" as can be seen in the network design (Fig. 3). In the MRS, data must be protected from unauthorized access. Only authorized teachers can log in to the system by user identifications, which are user names and passwords, see Fig. 9. If a person is unable to identify the code and password correctly, the system will not allow access to the system. Unregistered users can register can ask the system administration to generate a new username. A new user can freely choose a new password (score 4.78).

สถิติการมาโรงเรียนของแต่ละชั้นเรียนประจำวัน 25 Feb 2012

ชั้น	ห้อง	จำนวนนักเรียนมา (คน)	จำนวนนักเรียนไม่มา (คน)	จำนวนนักเรียนทั้งหมด (คน)
1	1	32	5	37
	2	27	5	32
2	1	22	5	27
	2	26	3	29
	3	17	6	23
3	1	31		31
	2	25	6	31
	3	21	8	29
4	1	19	1	20
	2	18	4	22
5	1	19		19
	2	18	1	19
6	1	21		21
	2	26	2	28

Fig. 7 Example of MRS's report, time attendance of students (Year 1 to 6)

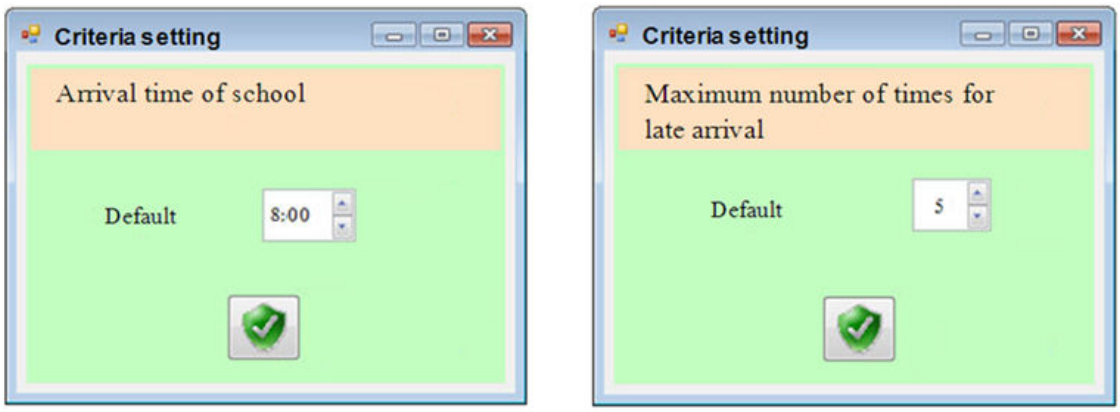

Fig. 8 The UI of criteria settings for MRS

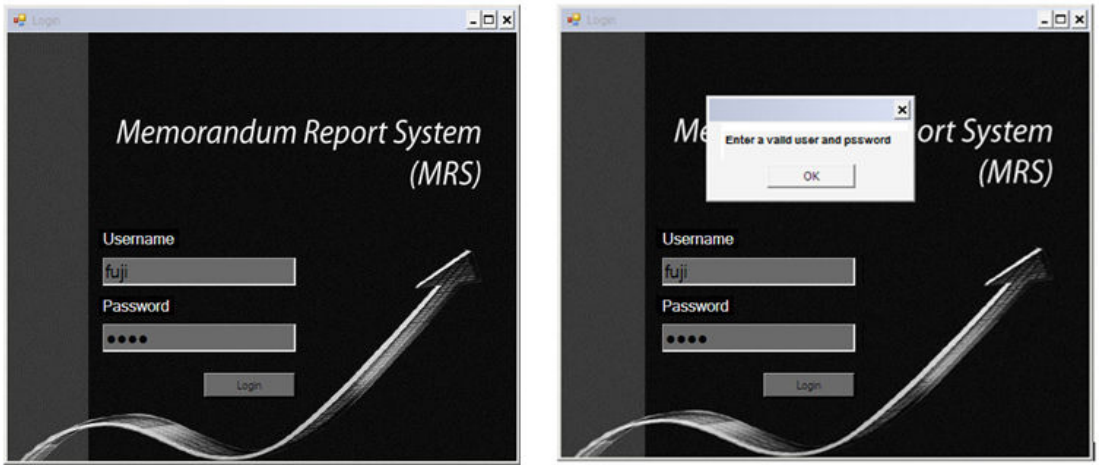

Fig. 9 The UI of Security login is required for authorized users

VIII. Conclusions

Our case study of MRS has revealed important information about Thai student behavior. From Fig. 10, it shows that number of students for late attendance (after 8.00 am) is low, which is approximately 92.46% of the whole students. In addition, average number of dismiss students during 21-25 Jan 2012 is 44.9, which is about 90% of the whole students. Fig. 11 shows that that there were one student was often come to school late. At the same time, we found that the sum of all dismiss students is 81, which is about 17.42% of the whole students in school. Only 35 students dismissed only one time in this week. Nevertheless, 15 students dismissed five times. With the use of our application, we found that a group of 15 students is required to be taken care of. Therefore, most students in this group will have learning problems. The school will take serious action on this group of students to enhance their learning skills. Teachers can consult with parents on time to prevent any harm to students.

The main focus of MRS is to monitor a student's performance and any undesirable behavior at Bangban School. After the system had been implemented in the school, the satisfaction and quality of the program were evaluated by the teachers and students. The results indicate that our system works well and supports all of the required objectives.

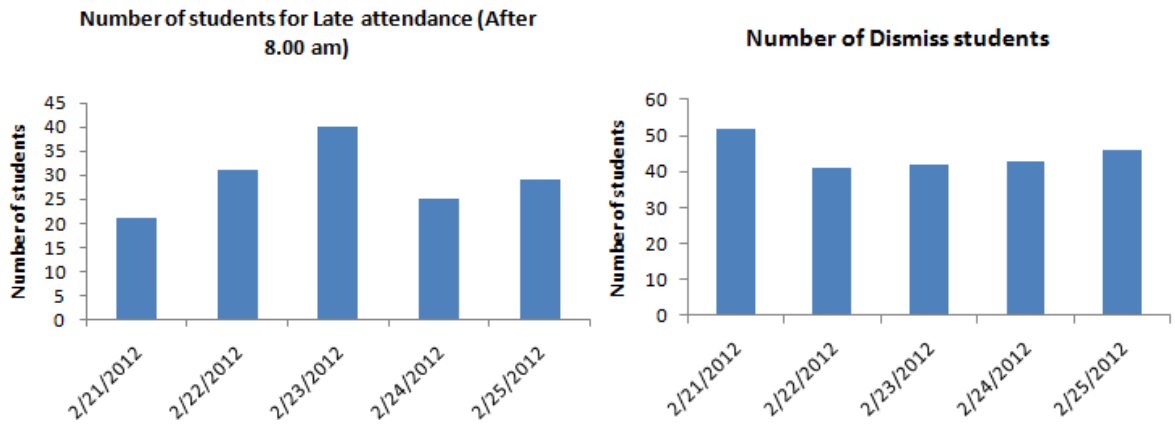

Fig. 10 Example of static graphs of year 1 – 6 students (465 students) derived from the MRS during 21-25 Jan 2012

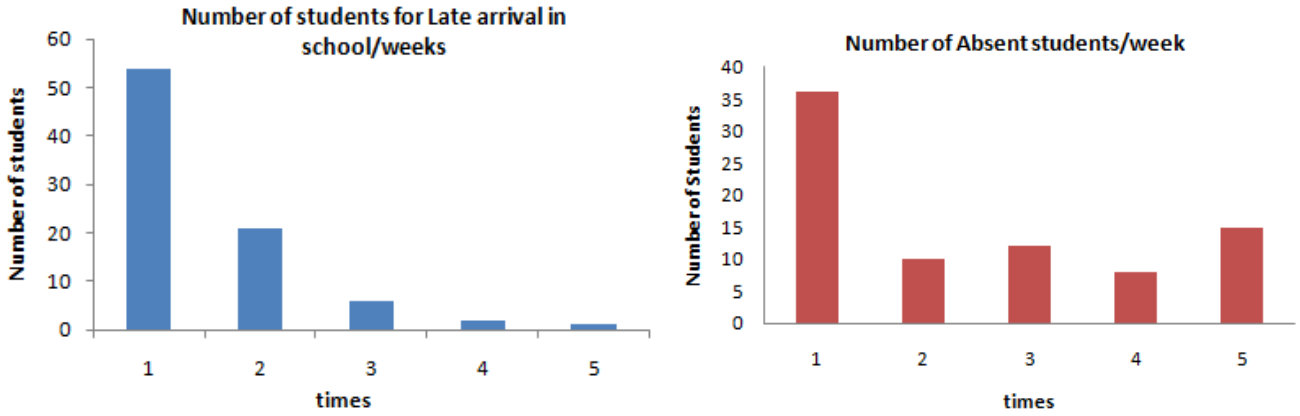

Fig. 11 The average number of absent students from school of Year 1 – 6 during a semester

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Anon Sukstrienwong received the B.Sc. in applied mathematics from King Mongkut's Institute of Technology Ladkrabang, Thailand in 1992. He received his master's degree in engineering from the University of Colorado, Denver, U.S.A. in 1994. He is currently an assistant professor in the department of computer and technology at Bangkok University in Bangkok, Thailand. His current research interests include: evolutionary multiobjective optimization, evolutionary algorithms in general.