A Student-Centered Learning Model

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Abstract: Based on the authors experience in applying different approaches of active learning and student-centered teaching, the main problem that prevented the achievement of the full advantages of these approaches is the lack of motivation of students for self-centered learning. A new model for a student-centered learning is presented in this work. This model is of teaching integrative thinking, based on existing models of creativity and synthesis. In this model, the student is put at the heart of a bigger learning process that includes instructors, specialists and the public. Usually students who are in the final year of their study will be the target of the application of this model as a part of a capstone course or final year project. This model promotes the research and thinking skills of the students as well as the gained motivation of self-learning as a result of being in contact with the specialists who might be their potential future employers. A proto-type web-based system based on this model was developed. Although it is applied on a sample of students from the Biology department, the system is readily expandable to any number of other disciplines without any complications or programming overheads. The results achieved from the application of this model were very encouraging.

Key words: Education, active learning, student centered learning, learning model

INTRODUCTION

Ever since the McMaster University Canada introduced problem-based learning (PBL) into medical education in the late sixties, this innovative approach has spread globally. Many new schools have adopted PBL at inception while several established schools have transited from the traditional lecture (teacher)-based curriculum to the PBL[1]. The widespread adoption of PBL in Medicine, Nursing and allied health professions in America and Europe[2,3] has just begun to catch up with the Asia-pacific region, particularly in the last ten years[4]. Problem-based learning, Active Learning (AL) and Student-Centered Learning (SCL) are all used in the literature to indicate the shift of emphasis from the teacher to the student as the heart of the learning process. According to the Greenwood Dictionary of Education, active learning is "the process of keeping students mentally, and often physically, active in their learning through activities that involve them in gathering information, thinking, and problem solving"[5,6].

Being challenged with the required transition from teacher-centered, lecture-based teaching to student-centered, technology-based learning, today's educational reforms call for successful technology-supported teacher education programs. Such programs should be based on some suitable educational technology (ET) standards, like those developed by International Society for Technology in Education[7]. Research has evidenced that: (a) student teacher's intention to use educational technology is influenced by perceived usefulness of that technology not by his/her subjective norms concerning it[8]; (b) student teacher's interest to achieve ET standards is primarily influenced by his/her computer attitude not by the institutional support concerning this achievement offered during his/her university study[9]; and to develop student teacher's interest to achieve ET standards, the institutional support concerning this achievement offered during his/her university study should focus on developing his/her computer attitude [10].

Student centered teaching's dependence on group effectiveness may lie at the heart of the difficulty for researchers to prove that student centered teaching improves learning[11,12]. Literature reported that although instructor effectiveness was the crucial item in learning at the start of the curriculum, by the end, learning was more a function of the effectiveness of the small group process[13]. The assumption that students can work together effectively is a misguided one. Few employed health professionals, much less students, have the skills needed to work in groups competently or

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effectively[14,15]. This should come as no surprise since traditional lecture or textbook generated learning is at the core of education from elementary school through many graduate level programs. Subsequently, students are forced to learn by trial and error how they personally work best in a group setting. Their communication and group interaction habits are developed over two decades of formal education. These habits, however, differ from student to student. Some may try to take control of the group, others will become passive, and still others will become overly verbose, while others will shy away from commenting. Observers of student group interaction often find that students do not work productively, waste time, repeat old information, or become confrontational[16]. Regardless of the problem posed to a group of students, learning is proportional to the ability of that group to work effectively together[17,18]. Faculty, too, may lack the ability to utilize problem-based learning effectively because of a lack of training in small-group management[19]. In some instances, they may find themselves in small groups that actually harm individuals and the learning climate[20].

Generally speaking, students at the UAE University believe in the importance of being self-directed learners and favor the use of student centered teaching as a practical approach and the concepts learned can be applied in a real situation. However, there are many problems in facilitating PBL on the ground. The PBL and student-centered learning literature has explored a variety of issues related to the value of PBL tutorial sessions. The role of PBL in the clinical reasoning process[20] has been discussed thoroughly, along with the comparison of conventional and PBL curriculum in the development of diagnostic competence[21,22]. Similarly, the effects of PBL tutorials have been investigated on student study behaviors[23,24]. In this work we propose a new model for student-centered learning. We believe that the model will contribute in solving some of problems related to the facilitating of PBL and SCL.

The remaining of this paper is as follows. In the next section the new learning model is presented where all system modules and their subsequent sub-modules are described. Also described are the system modes and their corresponding users. In the section that follows the users of the system and their roles are explained. The technical details of the proto-type web-based system that was developed based on this model and the facilities that it provides are also explained.

THE MODEL
The Purpose: The intention behind this work was to design a model and build a prototype for a system that can be realized and can grow without any problem. A system that brings the university, the society and the specialists in a knowledge partnership that breaks the academic walls.

System main requirement: The system had to be designed in a highly modular fashion. One can start with a pilot project of one or two modules and then other modules may be added without any implications or overhead to the system. This means, adding new modules will not require change in the main software system and hence will not complicate the system.
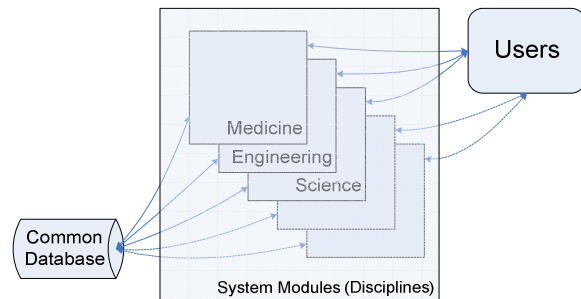

Fig. 1: Overview of the system structure

Description: A *module* here represents a well recognized academic discipline such Medicine, Engineering, Science and others. Figure 1 represents a schematic diagram of the general structure of the system. Each module consists of one or more sub-modules. Each sub-module can be seen as an independent system, however, all modules and their sub-modules are accessed through one entry point and all share the same database. Apart from that, the users of each sub-module work independently from the others. Examples of sub-modules are seen in Fig. 2.
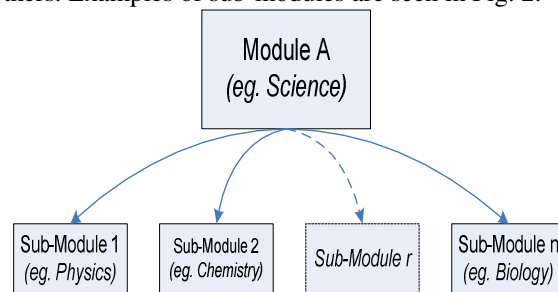

Fig. 2: A module and its sub-modules

It is obvious that every university or educational institute has its own academic structure and therefore it will have a unique model. For example if the department of physics in a university has some independent majors within the department such as nuclear physics, solid state physics, medical bio-physics

etc., the system can accommodate these and consider them as lower levels sub-modules.

The model was designed to work in four different modes and used by four different categories of users. The system modes were the Clients Mode, Instructors Mode, Students Mode and the Specialist Mode. The system users were the Clients, Instructors, Students and Specialists.

Figure 3 depicts the system modes and users. The Instructor is the most privileged user who can have access to all other users, while other users are only allowed to access their own areas. The system is
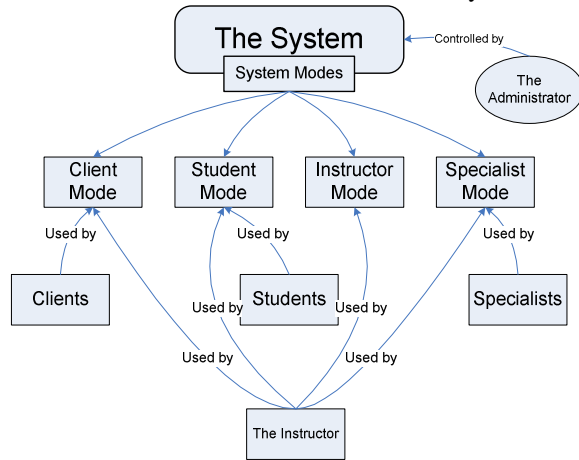

Fig. 3: The system modes and its users

controlled by an administrator who controls all activities and setting of privileges of this system. This administrator is also responsible to plug-in future modules and sub-modules and reconfigures the whole system.

All users have to register themselves and get approved by the administrator before they can use the system. Registration is mandatory in order for the system to log all the users' activities and to prevent abusing the system. Upon registration, the administrator will give each user a password and set up the required privilege level for their access. All users, apart from the Instructor, will be able to see their own screens only. The Instructor, however, will be able to see all the screens and hence will have the full picture of the over all process and its progress. All answers are linked with the data base.

Users of the system

Clients: Clients are the end users who will benefit from the system. Those are the people with questions and belong to public domain who can register themselves to the system in order to search for specific information or post their questions.

Public or client will have to select a main discipline such as "Science" and sub-discipline such as "Biology" and may go further down if the sub-discipline has independent majors. The user is then asked to conduct a search prior to posting his/her question. This is because of the possibility that the same question may have been asked and answered before. In this case the answer is already stored in the database and will be readily available. If the answer is not available or it is available but not satisfactory to the client's needs, then the client will have the option to proceed with posting his or her question. The client activities are shown in the flow chart of Fig. 4.
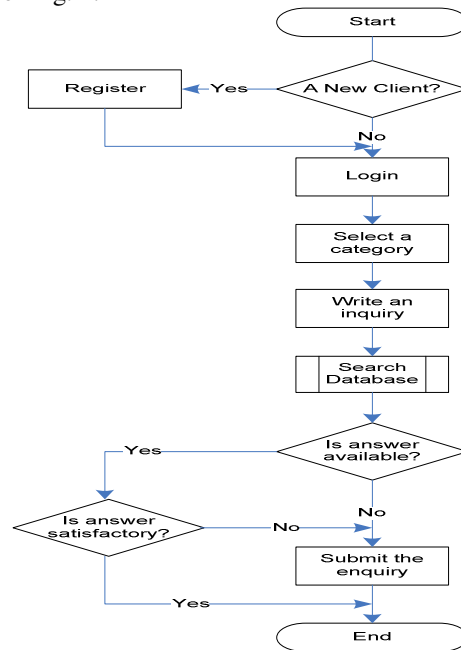

Fig. 4: The client activities

Instructors: These are the university professors who are responsible for teaching that course and will also be controlling the system and managing the flow of questions and answers from one section to another. They may participate in preparing the answer and modifying it from the professional technical language to a simple one that a layman client can understand

The instructor will have to login to the system regularly. A client posted having found a fresh inquiry in the field that; the instructor may approve or reject the inquiry. Once approved, then the instructor will transfer the question to the student domain. The instructor has to check for students' reports related to previous assignments. If such reports are ready, the instructor may need to re-phrase the reports to a language that is understood by the specialists before posting these

reports to the specialist's domain. The instructor has also to check for any answers reported back from the specialists' domain. If so, the instructor may need to rectify the specialist report to a language that is understood by a layman before moving the answer to the client domain.

This operation automatically creates an email message sent to the client who originally posted the question notifying him/her of the availability of the answer. The instructor activities are shown in the flow chart of Fig. 5.
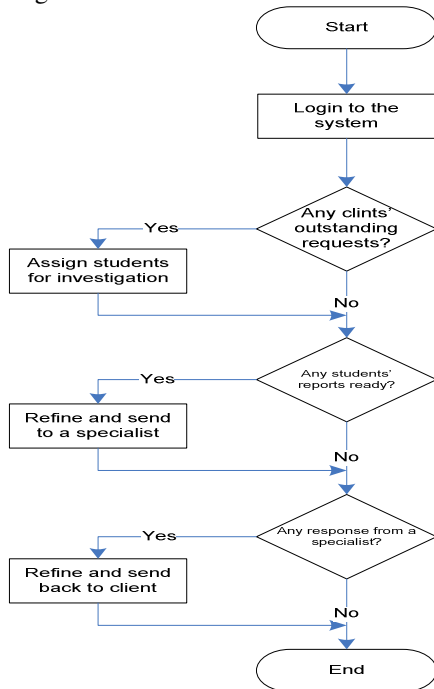

Fig. 5: The instructor activities

Students: These are the University students who are registered in their department for this course in and who will be able to learn better by using this novel approach. Usually these students belong to the final year of their course and will be involved in such activities as a part of a capstone course or final year project. In this way the student will not only be able to learn but will also be able to develop positive contacts with experts in their field who can be their potential employer in future.

Students involved in this project need to register to the system and need then to login to the system regularly. The student role is to investigate the question asked by the public related to their relevant discipline/course. The student will conduct a research using all available educational resources and prepare a report of all the possible answers or solutions to the

question and then move it back to the instructor domain. The student activities are shown in the flow chart of Fig. 6.

Specialists: These are the people from within or outside the university who are experts in their fields and have profound knowledge and extensive experience in the topics of the posted questions. They are not supposed to financially benefit from their services but they will rather benefit by getting exposed to the public. Besides, they will be having some helping hands from the students for their research work.
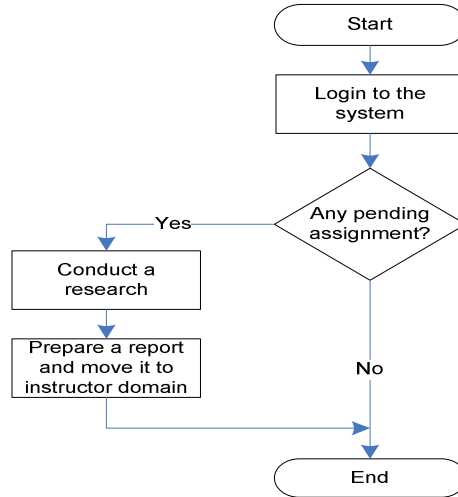

Fig. 6: The student activities

Specialists volunteered for this project need to register to the system and need then to login to the system regularly. The specialist receives a package that contains a question or a problem needs to be answered or addressed. It also contains a student report that describes the question/problem and all possible answers or solutions. The specialist either agrees or disagrees totally or partially to the student's findings. In either case, the specialist will formalize a final answer or solution to the problem and move it back to the instructor domain. The specialist activities are shown in the flow chart of Fig. 7.

System technical details: A prototype system for the Department of Biology, UAE University was developed. This is regarded as a pilot project in order to foresee the feasibility of applying it for other disciplines. This project was given the name "Bridging the Knowledge Gap". The system was designed to be

highly modular, that is, any new module or sub-module can be added without the need to modify the software or to add further complication to the system. The system was built as an easy-to-use web-based system with large number of accompanied tools and functionalities.
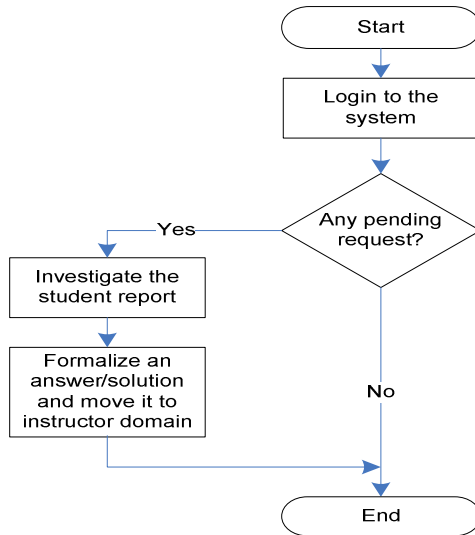

Fig. 7: The specialist activities

Administration: This role is going to be played by the administrative personnel of the universities for example, authorized personnel from the Banner Team of UAE University. These people are not only being responsible for authorizing user names and passwords to the students, instructors and specialists but will also be responsible for regulating and monitoring the system for that course.

First time users have to register to the system prior to any activity. The registration is only done once and is made mandatory so that the system can maintain a record of users and log all their activities. Users who are not registered to the system cannot view or access any pages.

Only clients need to be registered online and get approved by the administrator before they can use the system. Instructors, professionals and students are registered directly by the administrator and will receive a password to get access to the system. Users will have different levels of system access (privileges) with instructors assigned to be the most privileged users. Details of users interfaces and permissions are given in appendix I.

Logging to the system allows the user to surf into the system through the system main page as seen in Fig.

8. The user main page, however, contains all the links, services and options to the client needs.

The user main page: For convenient ease-of-use, the user main page is divided into different sections; each provides a related set of functionalities

The Menu Bar*:* The menu bar provides the user with links, information and services such as:
* **Help**: provides the help a client needs to properly use the system.
* **Search**: it is the search engine the client can use to search the database for a possible answer or solution to a specific question before submitting it to the system.
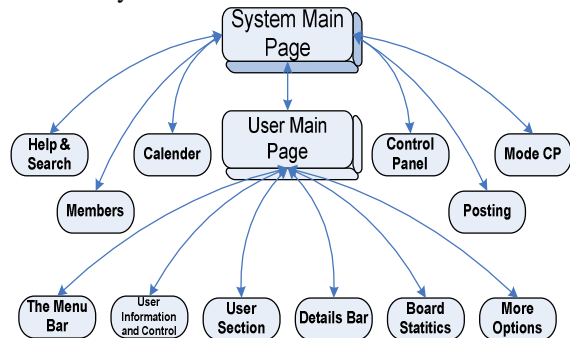

Fig. 8: The system site map

* **Members**: views the members who are registered and can use the system.
* **Calendar**: to view the events those are assigned by the Instructors or students.

User information and controls: This section displays the user personal and other information, links and services. These include links to the user new messages and new posts as well as a link to the day's active topics. It also provides the user with help facility but the most important one is the user control panel. The control panel, or "My Controls" is the place where the user can set and change the personal information in addition to some other functions. These will be explained later in this article.

User section: This section is different for each type of users. Users such as clients, students or professionals will be able to only see their own sections. However, the instructor is the only user who can see the sections of all the users on one screen. The user section contains a number of disciplines and this number may increase simply by means of extra plug-ins. Examples of these disciplines are science, engineering, medicine etc. Each

discipline may contain a number of sub-disciplines, for example, the science discipline may contain the sub-disciplines of physics, chemistry, biology etc. In the same manner, extra disciplines and sub disciplines may simply be added as extra plug-in components without any change to the code.

Details bar: It shows links to: the moderation team, today's active topics, today's top 10 posters and overall top 10 posters.

Board statistics: This section is for extra statistic information only. These include the number of active users of the system within the last 15 minutes classified as guests, members and anonymous members. User can get a list of those active members sorted by last click or according to names of users. It also gives the total numbers of registered users and number of posted questions. To add a bit of human touch to it, the system remembers the birthdates of its users and displays the names of the users who have their birthdays today.

End of page: This provides two more options to the user. The first is to delete all the cookies sited by the board from the user own computer. The second option is to give the user the choice to mark all posts in the red color.

Help page: The help page contains a list of topics that the user can select from for detailed help. Comprehensive sets of help files were provided by the system to guide and help users to use the system efficiently.
If the question does not fall in any of the listed topics, the user can search for a specific keyword instead. This provides an in-depth search for matching help topics.

Advanced search: Users can perform more advanced search within the search page. Users can enter a keyword or a phrase and can narrow the search using "Filter by Member Name" option. More search options are provided such as selecting one specific discipline with the ability to select sub-disciplines too in case of sub category is chosen. Users may also refine their search by selecting a specific number of days and then choose older or newer option. Further refinement of the search is also possible by selecting the "Search titles only" option.

Members: This page provides a table that lists all the members of the system. The table lists names of all users of the system with some details about each one. These include level, group, the date of joining, number

of posts, and email address. A user has the choice to hide or view his/her personal record (This is done through the personal control panel).

The user can perform a search on a specific member. Search options to narrow the search process are also provided. The user may search through all available members or select names begin with or contain specific character(s). Listing options are also provided to help the user to list all members or list only one group of members such as administrators, instructors, specialists, students or clients. Sorting may be selected according to member names, total posts or the join date in an ascending or descending order.

The calendar: A calendar is provided in a separate page. It shows the current month and its events such as birthday, a test date or holidays. All users except the client can post events on the calendar. They can also access the previous or coming months or go to any specific month.

User control panel (my controls): This is the messaging centre and user personal information. It comes in two parts: menu and detail area. The menu part contains the followings:

Messenger: This area provides a comprehensive internal e-mail system. It provides a convenient means of exchanging internal secure messages among all the users of the system. The user has the following options:
* Compose a new message;
* Go to Inbox, Outbox or Sent Items;
* Empty Private Messages Folders;
* Edit Storage Folders;
* Private Messages Buddies/Block List;
* Archive Messages;
* Save unsent messages; and
* Message tracking.

Subscriptions: This area lists the user's previous posts and the discipline that he/she is participating in; it has the following two options:
* View Topics; and
* View Forums.

Personal profile: Area where the user can edit and change his/her personal information and choose what information he/she wants to be public for others and what not. Four options are available:
* Edit Profile info;
* Edit Signature;
* Edit Avatar Settings; and
* Change Personal Photo.

More options: Here the user can edit some special settings regarding his/her email and the board. These include the following submenus:
* Email Settings;
* Board Settings;
* Skin and Languages;
* Change Email Address; and
* Change Password.

More detailed information of these menus is listed in detailed area.

This Control Panel is available for all user groups but may differ in some options. For example some options are allowed to be edited or changed by Specialists but not allowed for Clients and so on.

Posting an enquiry: The user is always advised to search the database for a possible answer or solution to his/her question or problem. If nothing is found in the database that satisfies the user enquiry, he/she then is advised to post the enquiry. A full editor is provided where the user can write, edit and format his/her message. If the user is using this service for the first time and needs a help, a wizard mode for a step-by-step guidance is provided. The user can also attach a file of any type and add images or emoticons.
With time, the database gets larger and the chance to find an immediate answer to the posted item will get bigger. Besides, all groups of users except the clients are able to add new topics to the database which will enhance it and make the use of the system more efficient and effective.

The administrator: The administrator has the full control of the system. Besides a large number of tools are made available for him/her to administer and maintain the system and keep it up-to-date. Administrator's tools come in to two categories: Mod CP (Moderation Control Panel) and Admin CP (Administrator Control Panel).

Mod CP: In Mod CP one may select a discipline and then from a drop down list select the required action. The administrator may moderate new topic queue, new post queue, or mass moving/prune topics. Moreover, the administrator can manage members and their IP's.

Admin CP: Admin CP is a special area where the administrator uses the available tools to control and administrate the system. Table 1 lists all tools and services grouped according to their functionalities.

CONCLUSION

This work aimed to establish a different approach to motivate and enhance student-centered teaching. It is based on a real-life experience applying student-centered teaching method for the final-year students at the Department of Biology, UAE University. It has been long noticed that students are lacking the motivation for such type of learning method.

In this work we have presented a new model in which the student-centered learning becomes at the heart of a bigger process that involves the transfer of knowledge beyond the academic walls. Students play the active role in this process as a part of their final year project or capstone course. All involved parties in this model (ordinary people or "clients", students, instructors and specialists) will benefit to different extent from the use of the system. The ordinary people will benefit by getting a free service. Their questions get answered or their problems get solved in an easy to use, secured and confidential manner. The specialists will benefit by getting exposed to the public. The students get involved in a new experience by fulfilling their class duties or projects and instructors will have another manner of performing student-centered approach of teaching.

A prototype web-based system is designed for ease of use as it is targeting the large sector of unprofessional people in the society. All the users' activities are carried out through this system.

This work is a pilot project within the UAE University. It is being experimented on a limited number of students at the Department of Biology as from the fall semester of 2005. The results so far are encouraging as students showed a good deal of enthusiasm.
The picture however is not all bright. It is obvious that it needs a significant amount of efforts to convince people to try a new approach. Using this system on a larger scale requires that departments need to make some changes to their curriculum in order to accommodate for the use of this system. Reluctance for change is always a problem and this case is no exception. The intention of the authors is to expand the use of the system gradually. A significant boost for adopting and using the system came from the scientific research department at the UAE University who signed an agreement with the authors to take the full responsibility of developing the full version of the system based on our model and applying it on a large scale in and outside the University.

Appendix

Users interfaces and permissions

Clients: Clients have the following permissions to the system:
* Login to the system;
* Search the system;
* View the clients section only;
* Post a new question in any discipline under clients section;
* Reply to another topic at any discipline under clients section;
* Attach a file of any kind to their posts;
* Using help files;
* Viewing member list;
* Viewing calendar and the events; and
* Sending and receiving personal messages (PM) to/from others.

Students: Student has the following permissions to the system:
* Login to the board;
* Search the board;
* View the Students Section only;
* Post a new topic in any discipline under students section;
* Reply to another topic at any discipline under students section;
* Attach a file of any kind to their post;
* Using help files;
* Viewing member list;
* Viewing calendar and the events;
* Adding a new event to the calendar;
* Editing personal information and system settings in "My Controls" area;
* Sending and receiving personal messages to/from others

Instructors: Instructor has the following permissions to the system:
* Login to the board;
* Search the board;
* View all sections in the board: Students Section, Clients Section, Instructors Section and Specialist Section;
* Post a new topic in any forums at all sections;
* Reply to another topic in any forums at all sections;
* Get access to new topics queue and approve them;
* Editing or deleting topics or replies in any forums at all sections;
* Moving topics between forums and sections;
* Attach a file of any kind to their posts;
* Delete the attached file from any post;
* Using help files;

* Viewing Member List;
* Viewing Calendar and the events;
* Adding a new event to the calendar;
* Editing or deleting an event from the calendar;
* Editing personal information and board settings in My Controls area;
* Sending and receiving personal messages from others;
* Get access to Moderation Control Panel (Mod CP) where to manage the forums and queue posts; and
* Login to the Administrator Control Panel (Admin CP) and act as an administrator to the system (Descriptions to Admin CP will come later on).

Specialists: Specialist has the following permissions to the system:
* Login to the board;
* Search the board;
* View the Students Section only;
* Post a new topic in any forums under Students Section;
* Reply to another topic at any forums under Students Section;
* Attach a file of any kind to their post;
* Using help files;
* Viewing Member List;
* Viewing Calendar and the events;
* Adding a new event to the calendar
* Editing personal information and board settings in "My Controls" area; and
* Sending and receiving personal messages from others.

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