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POST-GRADUATE PHARMACY STUDENTS PERCEPTION ABOUT CHANGES REQUIRED IN PHARMACEUTICAL EDUCATION AND USE OF LEARNING MANAGEMENT SYSTEM IN SELECT COLLEGES IN SOUTH INDIA

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ABSTRACT: A pilot study was conducted to understand the study habits of the post-graduation (PG) pharmacy students' in India and their perspective on the use of a Learning Management System (LMS) in line with the current system of education to meet the industrial requirements in Indian scenario. The researchers administered of an open labeled, questionnaire to understand students' study pattern, expectations from the use of a LMS to support their PG goals. Consents were taken from the students to use the data provided for deriving inferences for research purposes. Data was collected from all the students belonging to two premier private colleges in Bangalore, India and converted to graphical representations using Microsoft excel to provide simple percentages. The current trend in pharmacy education system shows that the PG students study/learn mostly during the internal and external examinations. This is a due to the pressure of doing well in the examination. This study also showed that the students study mostly from discussions, seminars and examinations. It was observed that the students wanted a proper orientation program that will train them in the best way to do the PG course and let them know of the options that will be available for them once they have completed the course. Eighty three percent of the students were excited to have the support of a LMS to provide them with a dashboard view of their performance in comparison with the rest of the class. This excitement can be related to the goal of the student to be competitive in the industry to get better salary if they can do well in their PG course. This pilot study should be considered as an revelation, as it shows that the PG student's needs continuous support in terms of online lectures, research support, practical industrial training, etc. that is currently unavailable. This support can be provided with the use of a LMS that will support the students round the clock, as well as post PG for enhancing ones skills, with guaranteed benefits as shown from studies conducted around the world in pharmacy colleges.

INTRODUCTION: The International Pharmaceutical Federation (FIP) under the able guidance of World Health Organization (WHO) held a conference in Vancouver (1997) for developing guidelines in Good Pharmacy Education Practice. The WHO, in their report on "Preparing the Future Pharmacist" identified seven roles, (the "seven star pharmacist"), which should be considered essential, minimum common expectations of pharmacists by health care systems world-wide. The identified roles and responsibilities were: *Care giver, Decision maker, Communicator, Leader, Manager, Life-long learner, Teacher* [1].

The 13 points that were listed down by the federation points towards constant evaluation and upgradation of the current system of education that are provide to the pharmacist all around the world [1, 2]. This should reflect that in the Indian scenario we need to improve the current system of education by creating a better training, teaching environment for the students such that they will be able to perform better. While all the points listed by the FIP can be debated as 'have been implemented' into the current education system, it can be easily seen that they lack the 'depth' which takes away the actual intended purpose.

The 'Depth' into implementation can only be obtained if there is sufficient revision based on continuous feedback that is provided by the students, faculty, college and university in order to uplift the educational status of the Pharmacy profession of the country. The recommendations on *Good Pharmacy Education Practice* provide only a conceptual framework for the design, implementation and assessment of contemporary educational programmes for pharmacists throughout the world.[1]

Pharmaceutical Education in India has progressed very much in the last 50 years. Almost non-existent at the time of Independence, it has grown sufficiently enough to generate highly skilled and technical manpower, to man the wide spectrum of pharmaceutical activities associated with the drugs/medicines in the country. There are number of problems, which creates barrier in development of Pharmaceutical education. Some of the cases highlighted for the decline in the quality and the quantity of the Indian contribution to pharmaceutical sciences are as follows [2, 3]:

- Improper coordination between PCI and AICTE

- Minimum or no industry-institute interaction

- Minimum or No computer aided pharmacy education

- No proper training for teachers

- Minimum collaboration with foreign pharmacy institute and distance education

This study was conducted to understand the post-graduate (PG) student's expectations when they join the PG course in pharmacy. This study will try to capture the following details:

- Understand the reason for joining PG course in Pharmacy

- Understand the problems that are faced by the student with respect to the study patterns and provide possible solutions

- Understand the student perception about a support system that would be supportive to the students to meet their goals apart from meeting the goals of the college, the university and national goals of the profession

- Understand the gap between the recent industrial requirements and the pharmaceutical education in India

- To find out from students about their needs to be meet the current industry requirements.

The Need: Shrivastava *et al*., conducted a strength vs. weakness analysis of the scope of pharmacist in the last decade which clearly indicates the need to revamp pharmacy education in-order to face the new challenges. They also found that the Pharmacists of today, has to answer a critical question posed by the medical staff, - "How is pharmacist's knowledge complementary in medical sciences to that of the other medical staff to provide better patient healthcare?" For the present pharmacist, this is indeed a difficult question to answer [2, 4].

It is no secret that after a pharmacy student completes his/her education at a bachelors or masters level, and comes to the industry, they suffer from lack of communication skills, leadership skills, basic management skills, training skills, decision making and above all, stops learning further and supporting self-goals and upliftment of junior pharmacists.

In-order to understand the current areas of improvement it is necessary to understand the students study patterns and expectations from the current pharmaceutical education system.

The Answer: To meet this requirements of change, certain modification have to be done to the current/conventional teaching method. The changes to be done are as follows [2, 3]:

- From unidirectional teaching (Lectures) to interactive teaching and learning (Discussions)

- From memorization for examinations to emphasis on clarity of concepts for application

- From monotonous lectures to videos or discussions using 3D models

- From a passive listening students to an active participating student

A learning management system (LMS) that is developed keeping the student, college and university requirements and curriculum as the core can be the answer to the achieving the above listed points.

The system should be developed on the basis of pointers from models of Instructional design and adult learning psychology like ADDIE (*Analysis, Design, Development, Implementation and Evaluation*); Bloom's Taxonomy (*Creating, Evaluating, Analyzing, Applying, Understanding, Remembering*); Gagne's Nine events (*Gain attention, Inform learners of objectives, Stimulate recall of prior learning, Present the content, Provide "learning guidance", Elicit performance (practice), Provide feedback, Assess performance, Enhance retention and transfer of the job*) and ARCS (*Attention, Relevance, Confidence and Satisfaction*).

REVIEW OF LITERATURE: Basak SC, showed in brief, the history and development of Pharmacy profession and education from Indian independence in 1947 in his review article. In 1948, the Pharmacy Act enacted as the nation's first minimum standard of educational qualification for pharmacy practice to regulate the practice, education, and profession of pharmacy. Currently, one needs at least a diploma in pharmacy to practice as a pharmacist. Provisions of the Act are implemented through the Pharmacy Council of India (PCI) [5].

Pharmacy education in India is regulated by two organizations: The Pharmacy Council of India (PCI), under the Pharmacy Act of 1948, and the All India Council for Technical Education (AICTE), which was established under the AICTE Act of 1987. The PCI makes regulations regarding the minimum standard of education required for qualification as a pharmacist. It is responsible for registration of persons fulfilling the prescribed eligibility criteria (minimum D. Pharm) and issuing a license permitting them to practice in an Indian state. Registration activity is decentralized and the state pharmacy councils are responsible for registering pharmacists in their respective states.

Thus, the PCI regulates the D. Pharm program and the recently introduced Pharm D. program. The B. Pharm program needs to be recognized by the PCI for the qualifications to be accepted for registration purpose only. However, the PCI has no jurisdiction over M. Pharm and other higher-level degree programs. These are regulated by the AICTE and all these programs must be approved by it. The AICTE is primarily responsible for planning, formulating, and maintaining norms and standards in technical education, which include pharmacy.

Besides the Pharmacy Act, the Drugs and Cosmetics Act of 1940, which stipulates the manufacture, distribution, and sale of drugs, also govern pharmacy practice. The AICTE is also responsible for quality assurance of pharmacy programs (D. Pharm, B. Pharm and M. Pharm) through accreditation by National Board of Accreditation (NBA) constituted by the AICTE [4, 5].

The PCI controls and regulates the standards for a better pharmacy education in India. The main aims of PCI are [4]:

- To prescribe minimum standard of education required for qualifying as a pharmacist ie, Framing of Education Regulations prescribing the conditions to be fulfilled by the institutions seeking approval of the PCI for imparting education in pharmacy.

- To ensure uniform implementation of the educational standards throughout the country.

- To approve the courses of study and examination for pharmacists i.e. approval of the academic training institutions providing pharmacy courses.

Today's curriculum of pharmacy education, B. Pharm, M. Pharm and Pharm D., has been designed to produce the following professional categories of pharmacists.

- Community and hospital pharmacists who will work as an important link between doctor and patient and will counsel the patient on various facets of drugs like usage, side effects, indication, contra-indications, compatibilities, in-compatibilities, storage, dosage etc.

- Specialist in research and development ie, research of new drug molecules, biotechnical research etc.

- Occupational specialist (industrial pharmacist engaged in pharmaceutical technology) ie, manufacture of various dosage forms, analysis and quality control, clinical trials, post-marketing surveillance, patent application and drug registration, sales and marketing.

- Academicians ie, Teachers of Pharmacy subjects.

- Manager and Administrators of Pharmaceutical Services working for various regulatory authorities and pharmaceutical systems.

- Chemists and Druggists engaged in selling of medicines.

However, there is no standardized B. Pharm curriculum and it varies across the universities that offer this degree. It is industry and product oriented. Unlike other countries, the curricular revision and innovation in India have not received adequate attention. The B. Pharm program of most of the Indian universities includes a mix of basic science (such as mathematics, physical chemistry, inorganic chemistry, and organic chemistry), advanced chemistry and analysis (such as biochemistry, medicinal chemistry, and analytical chemistry) and basic pharmacy (such as pharmaceutics, pharmacology, pharmacognosy, and pharmacy law).

The M. Pharm degree program requires an additional 2 years of study after a B. Pharm degree (a total of 6 years of pharmacy study). The M. Pharm degree is offered in many disciplines. The first part consists of 1 year of didactic course work (both theory and laboratory) and the second part involves completing a research project under the supervision of a pharmacy faculty member in a chosen discipline.

In 2008, the 6-year Pharm D. and 3-year post-baccalaureate Pharm D. began as professional degree programs in India focused mainly toward clinical and community aspects of the profession and mandatory practical training at practice sites. The Pharm D. program is comprised of six academic years, with 5 years of study and 1 year of internship and residency at a practice site. Six months of the internship and residency is spent in a general medicine department and 2 months each in 3 other specialty departments. The clerkship, coupled with project work covering drug utilization reviews, pharmacoepidemiology, pharmacovigilance or pharmacoeconomics, was also in place.

In order to demonstrate the requirements for pharmacists in India, it is necessary to undertake a pharmacy workforce study, to review student perception of the existing pharmacy education programs, and to compare them with the roles that have been accepted internationally. Then, to design and develop pharmacy degree programs, perhaps one program exclusively for industry and another for practice [4, 5]. As a process towards restructuring of the pharmaceutical education in-order to meet the challenges posed by the medical and paramedical staff, many universities have included subjects or specializations like industrial pharmacy, Pharmaceutical marketing, clinical pharmacy and

hospital pharmacy, which would be integral in creating future pharmacists. Another important step that has been taken is the introduction of Pharm D apart from the Clinical Pharmacy Practice at the master's level. This will clearly improve the quality of pharmacists who are scheduled to come into the industry in the next 6 years [5].

However, it should also be known that there are a number of new job opportunities that have been thrown open due to the globalization and cultural exchange that is currently happening in the country. Some of the new industries that have sprang up during the recent times are Clinical Research, Medical Communication, Data Management, Pharmacovigilance, Scientific Writing, Contract manufacturing for global multinationals, Pharmaceutical Project Management, Regulatory Affairs, etc.

Though there are a number of developments towards the upliftment of pharmaceutical education and industrial interface, the current status of pharmaceutical education does not enable the student to prepare for the diversified innovative field that have opened up in India. Hence, there should be an active system that is functioning towards providing the supportive of the interest of the Nation, State, University, College and students. The system should help in the overall goals of students, the college, and the long-term goals of the state and nation [2, 3, 5].

METHODOLOGY:

Selection of study site: For the study, Al-Ameen College of Pharmacy and Visveswarapura Institute of Pharmaceutical Sciences was identified in Bangalore, Karnataka, who were willing to set up a student support system for academic excellence that would support the educational goals set by the college and university (Rajiv Gandhi University of Health Sciences). The selection was based on the record of accomplishment, credibility of the college, facilities provided by the college and courses provided in Pharmacy (D. Pharm, B. Pharm, M. Pharm, Pharm D. and PhD in Pharmacy).

The study team got the necessary permission and support for conducting a free seminar on "Presentation and Study Skills for Students" from Al-Ameen and Visveswarapura pharmacy departments.

Based on the permission provided by the principal and faculty members, the colleges were selected and the date for the seminar was decided. The M. Pharm students were notified about the seminar two weeks in advance via notification on the announcement board of the college, as they were the targeted audience. Dr. Sundaresh, of LeaDS Solutions, Bangalore who had 12 years of training and development experience, conducted the free seminar.

Selection of students: The pilot study for understanding the need for a better system of learning was conducted, with the permission and support of the Faculty of the respective colleges. The interested candidates who were in their 1st year or 2nd year M. Pharm were welcome to attend the seminar for at the auditorium provided by Al-Ameen College of Pharmacy. The M. Pharm students from all the seven disciplines were asked to attend the seminar, if interested as the researches felt that the M. Pharm students of the college would have clearer reasons for doing PG studies and have all the necessary skill sets to understand the objective of such a study.

The objective behind preventing forced attendance was to get a major percentage of the students who would be interested to excel in academics and the pharmacy profession. This would result in collection of the most authoritative data from the students. All the students who participated agreed that the data could be used for deriving inferences for research purposes without any objection

Development of questionnaire: In an attempt to understand the current scenario in terms of the mentality and basic skill sets of the student, a questionnaire was developed with the help of the HOD of Pharmacy Practice department. This questionnaire was developed to understand the following:

- The motivational factors for joining M. Pharm.

- Students perception on the basic skill sets required for joining M. Pharm

- Were the students provided with an orientation program in the department about the course and the professional prospects after the same

- What helped them in understanding the concepts for each of the chapters clearly

- Learning/study habits of the students during the course

- What were the areas that they felt they needed to improve upon to perform better in the M. Pharm curriculum

- Would a centralized monitoring system be helpful in tracking and planning the study throughout the course and after that for obtaining suitable jobs.

The questionnaire used for the study is in Appendix I.

Appendix I:

1. Why did you join M.Pharm? What were your motivational factors?

   a. Better salary
   b. Peer Pressure
   c. Not sure

2. What according to you are the basic skillsets that is required to join M. Pharm?

   a. Research Interest
   b. Communication Skills
   c. Not Sure

3. Did you have an orientation program in the department that would tell you about the course and how to successfully go through with the course program and the opportunities after this?

   a. Yes (faculty/college)
   b. Yes (From Seniors)
   c. No

4. Would you like to have such an orientation program in the department that would tell you about the course and how to successfully go through with the course program and the opportunities after this?

   a. Yes
   b. No
   c. May be

5. What would you describe as the areas/activities that taught the most important thing related to each topic?

   a. Discussions
   b. Examinations
   c. Seminars
   d. Internal examination

6. If you were given a chance to better the things in M. Pharm 1st year, what would those be?

   a. Communication Skills (Written and oral)
   b. Discussion Skills
   c. Industrial exposure
   d. Presentation Skills

7. How would you like a centralized system that would enable you to view and support your progress throughout the year? (hence helping in keeping a track and help in planning a better study pattern)

   a. Yes
   b. No
   c. Maybe

8. Would Presentation skills and Study skills workshop at the beginning of the year be helpful?

   a. Yes
   b. No
   c. Maybe

9. When do you learn/study the most

   a. Regularly
   b. During the internal examination
   c. During Examinations
   d. Others (please specify) –

10. When do you NOT learn/study?

   a. Every day
   b. Immediately after internal examination
   c. Others (Please specify)-

Data collection: The pilot study was conducted by administering the survey questionnaire that was developed with the help of senior faculty members who had vast experience in teaching and student behaviors. The questionnaire was meant to understand the current mental make-up of the students and their requirements for a better system of

learning. The questionnaires were distributed to the students after the seminar. The students were provided 15 minutes to complete the questionnaire. The students were free to ask for clarification if they did not understand any question. The data was obtained in hardcopy and transferred onto a Microsoft Soft Office–Excel sheet for simple analysis and graphical representations

RESULTS: A total of 140 students who represent seven branches of M. Pharm at Al-Ameen college of

Pharmacy and Visveswarapura Institute of Pharmaceutical Sciences only 66 students participated in the seminar "Presentation and Study Skills for Students" which was conducted.

All the students who participated in the survey completed all the questions in the questionnaire and gave their approval to use the inference for research purpose. The result for the student strength for the seminar and the survey is depicted in **Figure 1**.
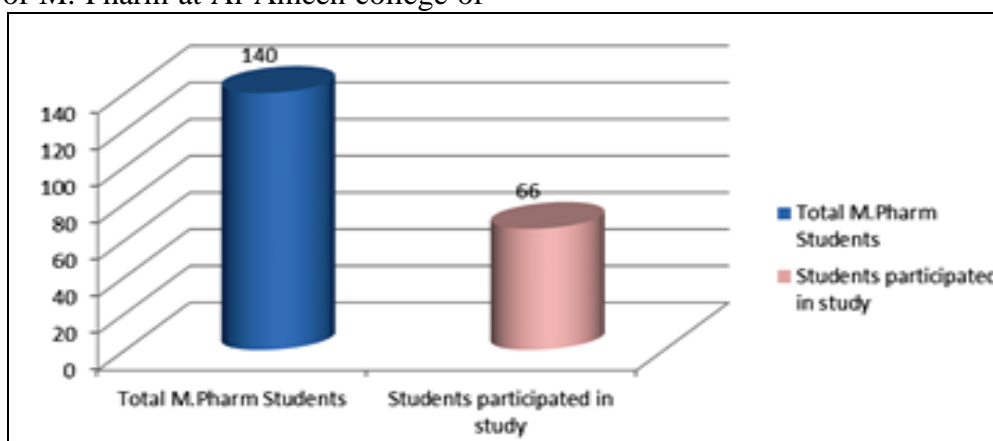

FIGURE 1: M. PHARM STUDENTS IN THE STUDY

Figure 2 shows the department wise turn-out of students who attended the seminar. It was observed that the attendance of M. Pharm 1st year students was more in number when compared to the 2nd year students. This was because the M. Pharm 2nd year students were busy with the project work and hence could not join the seminar. The pharmachemistry department had a total of 7 and 6 students from 1st year and 2nd year M. Pharm respectively, participating in the survey with the 2nd highest turnout. The Pharmacy Practice department with 17 students from 1st year and 3 students from 2nd year was the department with the highest turnout among all the other branches.

Pharmacology department was represented by 7 students from 1st year and 1 student from 2nd year. Pharmacognosy department was represented by 4 students from 1st year followed by 1 student from 2nd year. Pharmaceutics department had 6 students each from 1st year and 3 students from 2nd year turned up for the seminar. The pharma marketing department had 3 students who joined us from 1st year and 2 students from the 2nd year. The only department with more students in the 2nd year (4 students) and less students in 1st year (2 students) was in Quality Assurance department (see Fig. 2).
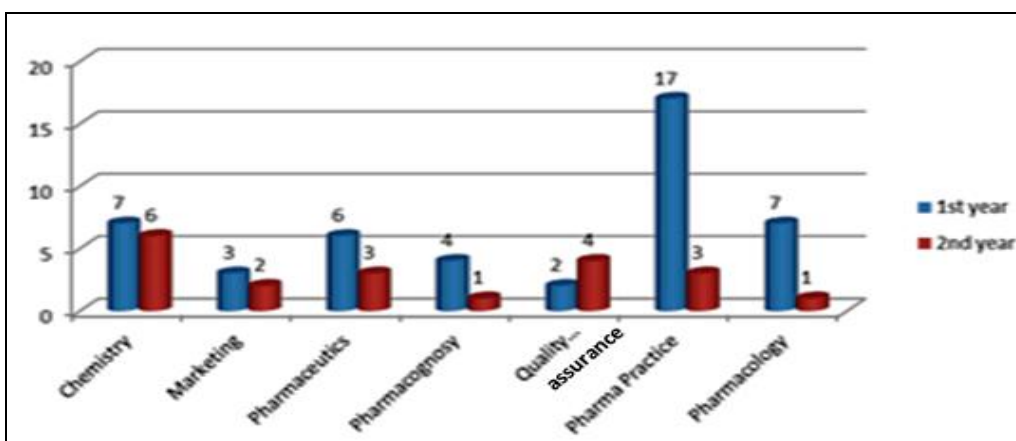

FIGURE 2: M. PHARM STUDENTS DISTRIBUTION IN THE STUDY

In order to understand why the students joined for M. Pharm we asked the students what were there motivation factors. Of the total number of students who were enrolled into the survey 61% of the students mentioned that they joined M. Pharm for a better salary, while 24% of the students said that they joined for M. Pharm because of peer pressure. (The peer pressure was defined as friends from B. Pharm had joined into M. Pharm and other colleagues at the work place were M. Pharm). The other 15% of the students were not sure why they joined M. Pharm (**see Fig. 3**).
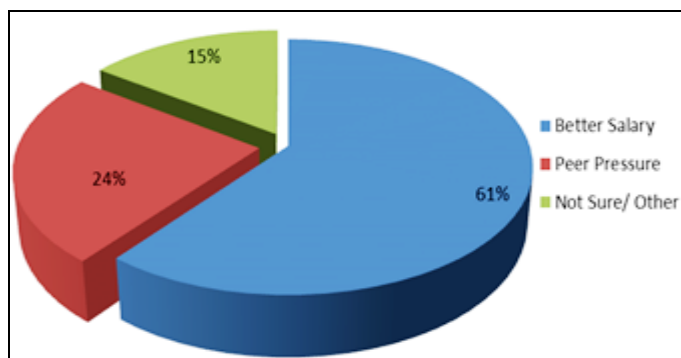
FIGURE 3: STUDENTS MOTIVATION FOR JOINING

Out of the total number of students enrolled into the survey, 54.5% of the students felt that in order to join and be successful in M. Pharm they needed to have good communication skills (written and oral), while only 24.2% of the students felt that good research interest was required to join and become successful in M. Pharm. The remaining 21.2% of the students mentioned that they were not sure what were the skills that were required to join and become successful in M. Pharm as they felt that a group of interests are require to join M. Pharm resulting in confusion (**Figure 4**).
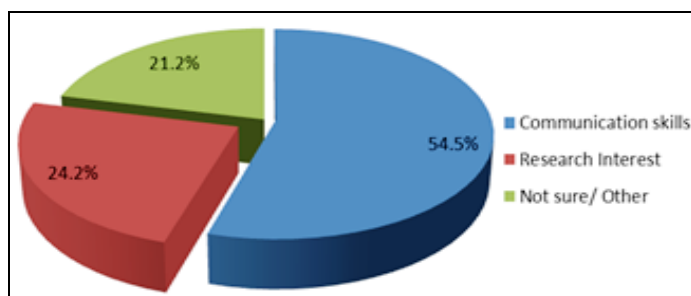

FIGURE 4: STUDENT PERCEPTION ON SKILLS REQUIRED FOR JOINING M. PHARM

It was also interesting to note that 23% of the M. Pharm students who attended the seminar wanted to improve their communication skills and presentation skills as they felt that they required help in this area.

The next area that the students wanted improvement in was discussion skills (30%) as shown in **figure 5**. The last of the areas that the students wanted exposure was in the Industrial area (24%).
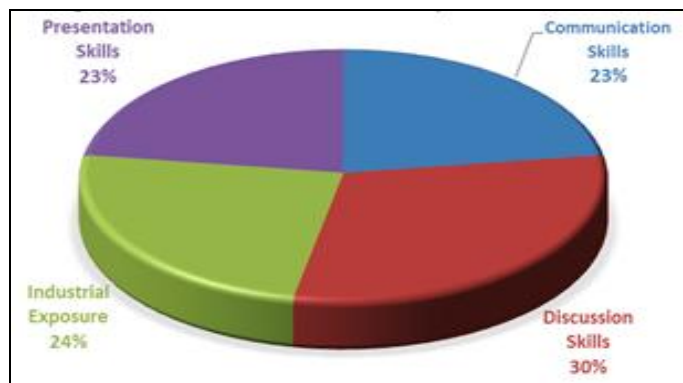

FIGURE 5: STUDENT IDENTIFIED AREAS OF IMPROVEMENT

It was observed that 91% of the students in the study population strongly felt that special emphasis or coaching in presentation skills and study skills will be very helpful at the beginning of the academic year while 9% of the students felt that this may not be helpful (see **Figure 6**). However, it was clear that all the students had a strong interest to excel in academics as well as be better at their presentation skills at the beginning of the academic year such that they had time to improve in their presentation and also apply study skills. The students were clear that such a seminar will be able to help them to, not only gain better marks but also help in the retention of the knowledge gained.
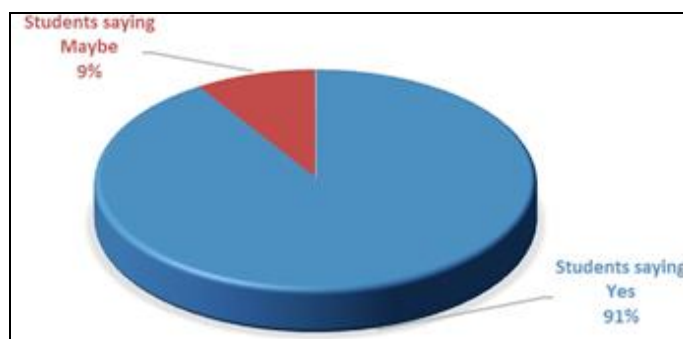

FIGURE 6: STUDENT'S VIEW ABOUT PRESENTATION AND STUDY SKILLS AT THE START OF ACADEMIC SESSION

It was alarming to note that 86% of the students felt that they would surely like an orientation program at the beginning of the year about the course, expectations about the student in the course and the opportunities that are available to them after they finish the course.

14% of the students said that they have obtained this information from the senior students who were currently with the college as well as whom recently passed out from the college (see **Figure 7**). This clearly shows that, currently there is no system of orientation programs for the students on the parts of the course, or on how to perform better academically which would eventually meet the student, college and university objectives of the course. The students get a partially correct image about the opportunities that are available after finishing the course.
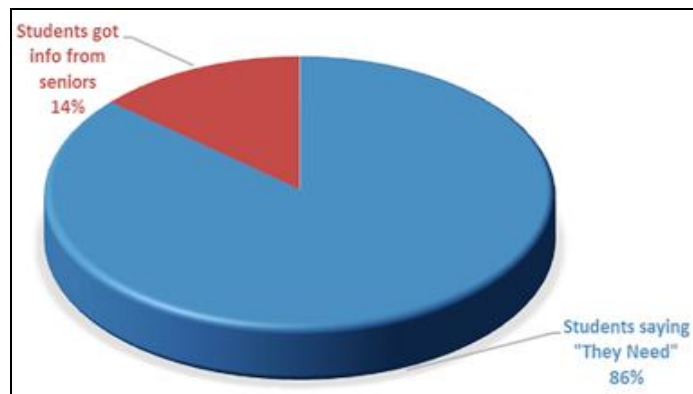

FIGURE 7: ORIENTATION PROGRAM TO THE COURSE AND PROFESSIONAL FUTURE

In order to understand the study patterns of the students through the academic year, we had included the same into the questionnaire. It was observed that an alarming 68% of the students only study during the internal examination. The rest of the time is not taken seriously for academic excellence and further research (**see Figure 8**). Similarly, it was noted that 15% of the students study only during the examinations and not regularly. The study result also showed that 17% of the students studied regularly. This would clearly be the differentiating factor why only some students top the class while the other students who make a last minute attempt may not raise upto the standards.
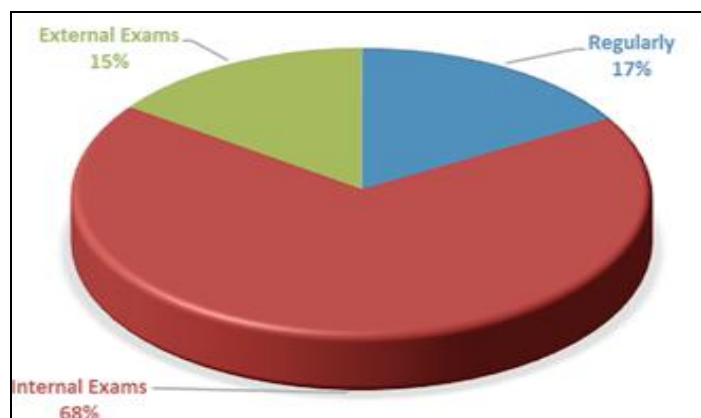

FIGURE 8: STUDY PATTERN OF STUDENTS

The study also attempted to understand when the students DO NOT study. According to the survey 68% of the students mentioned that they do not study every day while 23% of the students mentioned that they do not study immediately after internal examination (see **Figure 9**). The students who did not want to provide the accurate answer to this question was around 10%.
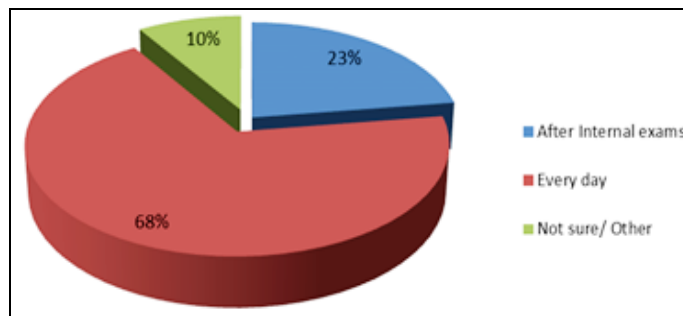

FIGURE 9: STUDENTS VIEW WHEN THEY DO NOT STUDY

It was interesting to observe that maximum number of the students felt that they are able to study, understand and hence obtain maximum study results when they discussed the topics that were being taught in class (36%). In such cases the students were able to apply the knowledge gained when the need arise.

The next set of population voted that they were able to study, understand and obtain maximum study results during the examination period (27%). A total of 23% of the students felt that they were able to study, understand and obtain maximum study results during internal examination. 14% the students felt that they were able to study, understand and obtain maximum study results during seminars (see **Figure 10**).
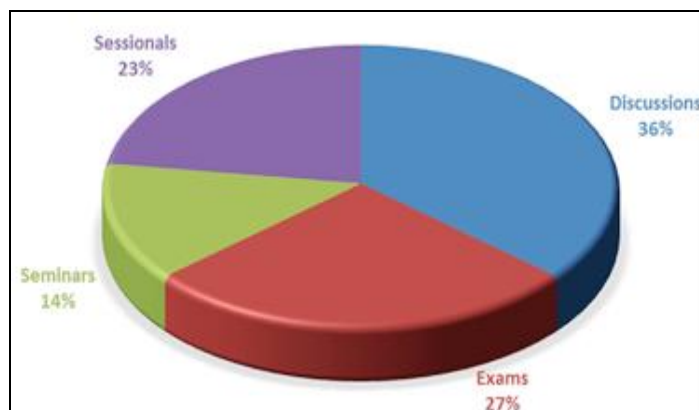

FIGURE 10: STUDENTS VIEW ON MAXIMUM LEARNING CAN BE OBTAINED FROM

On being asked if the students were interested of an option to have a LMS which could provide a single window for monitoring their academic and overall performance on a regular basis, 83% of the students said yes while only 17% of the students said that they may be interested (see **Figure 11**). As the students approached this question the concept of single window approach was explained to them as they attempted to answer this question. The explanation provided was "Single Window Approach" is the possibility to constantly monitor one's performance online, on a daily, weekly, monthly and yearly/semester basis in comparison to the rest of the class/batch. This system will help the student perform a self-introspection on his/her standing with respect to the rest of the class, in terms of regular performance across all subjects.

The reason for 17% of the students stating that they 'may be' interested in such a facility could be because the students were already doing well in academics and they did not require such a support system or, the students were not sure as they could not understand what was meant by "Single window approach" till they actually use it.
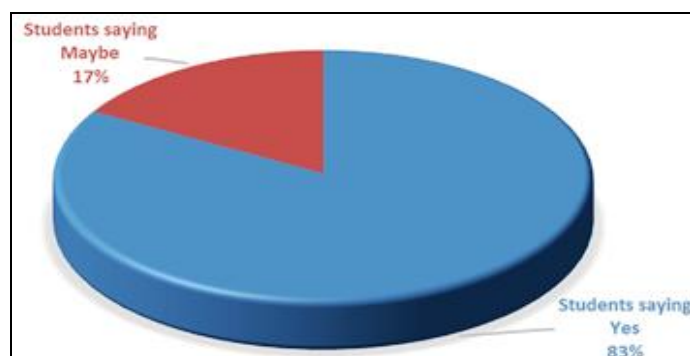

FIGURE 11: STUDENT'S VIEW ON SINGLE WINDOW MONITORING SYSTEM FOR PERFORMANCE MONITORING

DISCUSSION: The total number of students inducted into the PG course in Pharmacy is between 10-12 students per specialization. This approval is provided by the PCI or AICTE based on the resources, faculty, space available for ensuring that there is the best possible output of students who can contribute to the betterment of the society and the profession. This accounts for just 98 students for the academic year 2010-2011 in the college. As per the results depicted in Figure 1, the turnout of just 53% (66 out of 140 students) of the total study population can be because of the upcoming internal examinations that the students have to prepare for.

Figure 2 show that 1st year students were more interested in the study skills seminar that was organised when compared to the 2nd year PG students. This is because the 1st year students will have to take up the internal and final examinations that are scheduled as per the guidelines of the university, while the 2nd year student will have only a specific examination based on their thesis work. The 2nd years were more confident about their topic of study as they have an entire academic year to prepare for the thesis related examination.

As shown from the results of the total students inducted into the college for the academic year, it can be seen that Pharmacists and pharmacy support personnel in many countries are too few in number and trained at a critically insufficient scale. While Pharmacists represent the third largest health care professional group in the world after nurses and doctors, the ratio of the pharmacy workforce to population varies widely between countries, from 0.8 per 10,000 populations in the African region to 5.4 in the Americas.

This makes the quality improvement of pharmacy education and training very essential for addressing workforce shortages and for meeting basic health needs all around the world. Recognizing the need to develop a vision for pharmacy education, and to ensure a sustainable pharmacy workforce relevant to needs and build the local capacity of pharmacy higher-education institutions, the International Pharmaceutical Federation (FIP) launched the Pharmacy Education Taskforce with the World Health Organization (WHO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) in March 2008 after a series of global consultations on pharmacy education. India is also a part of this endeavour [1, 6].

As observed from Figure 3, the baccalaureate students were joining M.Pharm specialization for better salaries and better prospects in the future as shown from the student response of 61%. From a practical point of view, this can be observed in most professions, the more qualified or specialized the candidate, the more the preference for them over the others. In India, due to the high population and limited job opportunities, there is a constant race to be the best in the relevant field. This is the only way to reach better salaries and expect to have a better lifestyle.

In the same population, 24% of the students said that they joined PG due to peer pressure from students and family.

The peer pressure was due to the better opportunities that were available for the students who did their PG in pharmacy. Fifteen percent of the students said that they were not sure why they had opted for M.Pharm. This was mainly because the students had high expectation about the training that they would receive during PG, which will help them in their job options in the future. They also had the dilemma of joining management courses or PG in Pharmacy.

The study results showed that around 54.5% of the students felt that communication skills and research interest form a prerequisite for joining M. Pharm (Figure 4). This point should be noted, as the students know that they need to be good in communication (both written and oral) in order to succeed at the PG level. The reason that they provide was that in the industry and in the general walk of life a strong skill that is required is communication.

However, Figure 5 shows that 23% of the students felt that they needed help in the area of Communication skills (written and oral), Presentation skills and 30% in Discussion skills. Twenty four percent of the students said that they wanted more exposure to industrial requirements. Figure 6 also augments that the communication/ presentation skills (oral communication) of the students require support.

Figure 7, depicts that the students have not been oriented towards what can be expected from the course that they have undertaken. Orientation program was narrated to the students as, the best approach to do the course, how to prepare for the class, internals, examinations, and other expectation of the college and university. The other area was in terms of job opportunities after completing the course, the career decision that one has to make, the companies that can provide them the requisite jobs, etc. They also required training on study skills that would help them in learning more effectively. From the inputs gathered from figures 4, 5 and 6, it was observed that the students are not confident of their communication skills, presentation skills and learning abilities despite having 16 years of education behind them.

This response could also mean that, for many students this would be the highest education they will have and they would like to give it their best, and hence require training in the listed areas. However, from experience in the area of pharmaceutical education one would know that the lack of the listed abilities is a key factor for lack of quality professionals contributing to Pharmaceutical revolution in the country.

The next area that was analyzed was the study pattern of the students. Figure 8 shows that 68% of the students studied only during the time of internal examinations. This is a global phenomenon where people tend to procrastinate all the work till deadline. Only 17% of the total population studied regularly to meet up with the requirements of the course. We tried to capture reconfirmation data (Figure 9) about the study activities of the students and found that 68% of the students did not study regularly while 23% of the students do not study within the two week time duration of internal and external examinations.

On analysis, it was observed that 36% of the students felt that they learnt more through peer group discussions as shown in Figure 10. This was found to be the most effective way of learning as proved by a number of studies [1, 2, 11-13]. Around 27% of the students said that they felt that they learnt most during the external or internal examinations. This could be because of the sheer need to perform better among the peers and get better marks than usual. It is a well-known phenomenon, which is true with all individuals to fear the unknown. This lack of knowledge about the test and the resulted outcome triggers the need to perform better towards a deadline. Around 14% of the students felt that doing presentations was a good learning experience. This can be true as the students had to unknowingly follow the PSQ3R principle of learning (Plan, Scan, Question, Read, Recall, and Recite) for giving the presentation.[7]

Figure 11 shows that the students were very interested to have a single window to monitor their performance with the rest of the class. This single window can also be called as a dashboard of a Learning Management System that will show the students their academic performance with respect to the rest of the class.

The students were told that they will get an opportunity to review key takeaways from each and every lecture, laboratory work, attend online discussions with other classmates on the topics covered in class, work on journal publications with students from other universities and colleges, have opportunities to discuss the industrial requirements with the key industry people, etc.

There is a need to emphasise that the pharmacy students' needs to get habituated to utilizing computer technology to keep up with the changing world (utilization of multimedia computers and software technologies).

Pharmaceutical and technological aspects requiring graphic representation and mathematical complexities in biopharmaceutical calculations, computer-aided programs can simplify all the topics as required by the university curriculum and the Industry. The main aim of digital technology with the help of LMS is to develop excellence in pharmaceutical education and make person more skilled to suit the modern environment and cater to the needs of rapid industrialization.

The oral instructions/ lecture mediated instructions, have always been an important method for transfer of information from the teachers to students, but to attract student interactions, the following new techniques really helps. The best outcomes can be brought by:

1. **Compact Disk (CD) based or Online Video or Audio lectures**: CD or online video or audio lectures that cover the core concepts of the lecture can be covered by eminent people from the different fields of pharmacy with actual application into the current scenario of pharmacy. It is noteworthy that videos have more far reaching effect than the audio files in education. This will be very supportive in the field of pharmacy education.

   The industry can prepare some video lectures in their fields of specialization for use by the university students which will be available as ready-reckoners that can be visited regularly to ensure that the concepts are embedded strongly into the minds of the students [1, 2].

2. **Tele conferences or Video conferences**: Tele-conferences or video conferences can be made possible between most universities/ colleges; such conferences will enable students to ask questions from eminent people anywhere in the world and also find out the latest research activities that are being conducted in the various branches of pharmacy. The same will also provide as a strong base for conducting joint research activities.

3. **Recorded lecture or laboratory experiments in selected topics**: This can be a list of lectures or experiments that can be made available in libraries or online for easy access for the students based on the need to recollect.

4. **Programmed correspondents between students & universities across the Nation**: This kind of interaction and sharing of ideas will surely place the Indian pharmacists on a global platform which will result in developing joint research programs and multiple interactions between researchers and students from different universities and colleges.

5. **E-Newsletters**: This could be electronic newsletters that will keep the activities and progress of different colleges and groups in the last month and can be made available online. [1,2]

6. **Online Discussion Forums**: This will be a place where the students will be able to participate in online discussions related to a particular topic of interest in relation to the university curriculum and gain better understanding about a topic. This will help the student understand the concepts better with the support of an online mentor

7. **Online tests**: This will help the student take up online tests related to the topic of discussion and constantly get feedback on the answers and improve their scores by repeating the tests till they get 100% answers correct. The feedback system will give the answers with the authentic text book references as mentioned by the university curriculum.

Mehvar and colleagues has provided their inference on the best method to teach would be to use the support of a LMS to take a blended learning approach to teach the topic of Pharmacokinetics.

This study showed that the LMS used by this instructor in a pharmacokinetics course offered to entry level Pharm D. students are presented for the topic of relationship among pharmacokinetic parameters. These tools consist of specific outcomes/objectives, a reading hand-out, a practice problem as a focus of in-class discussion, several online web-based computer simulation modules, a take-home online assignment similar to the in-class practice problem, and an online in-class quiz.

The main benefit with this system was that except for the quiz questions, students are provided with all the tools in advance of the class sessions for this topic and are expected to attend the class prepared to discuss the practice problem. Thus, the class time is then devoted to the discussion of the problem and simulations by both the instructor and students, with minimal didactic lecturing. The students will take a quiz at the end of the class and submit the online assignment by midnight of the day the class is held.[8]

In a study by Hilton, an attempt to examine the effect of learning experiences that utilized digital technologies to support students in using multiple representations and through writing-to-learn activities to create multimodal texts on learning outcomes in chemistry was conducted.

The study included 2nd year students from 11 chemistry classes. The student interviews revealed a number of advantages of using digital technologies, including promotion of higher order thinking, enhanced motivation and interest, the capacity of digital technologies to support and enhance visualization, and the production of multiple representations in multiple modes. Students suggested that the digital resources allowed them to make links between macroscopic, molecular, and symbolic levels and to include a range of representations in their explanations. The evaluation questionnaire revealed similar trends.

Analysis of the students' texts suggested that this approach was effective in supporting students' content and rhetorical problem solving and the interactions between the two. Students utilized a range of representations, particularly structural diagrams, when making explanations of their macroscopic data on the submicro-level.

Thus, significant findings of the study relate to the importance of digital technologies in generating multimodal texts and representations for instruction, scaffolding, and in student-centered inquiry-based learning[9].

Another study by Cahyadi to study the benefits of a blended learning approach included, teaching elements in the experimental classes like reading quizzes, interactive lecture demonstrations and student discussions. The control class was taught in the traditional style, dominated by an instructor lecturing on concepts and problem solving examples. The cognitive improvement was measured by a standardized test and examination grades.

The students in the experimental classes showed significant improvement in conceptual understanding and problem solving skills compared to the students in the control classes. While the experimental groups welcomed the modified instruction, they still held the view that the lecturer should play the dominant role of presenting the material. The students asserted that activities using real-life materials were interesting and useful[10].

Jamero and colleagues attempted to understand better teaching methodology by comparison of Computer-Mediated Learning (CML) and Lecture-Mediated Learning (LML) for teaching pain management to pharmacy students.

The need for the study raised as pain management also has been taught in a fragmented way and at times omitted from the formal curriculum all together, mainly because of time constraints. This study compared the instruction of pain management by CMI vs. LMI. An examination was administered and a student survey was conducted to determine effectiveness and student perception of efficiency and satisfaction with these teaching methods.

Mean examination scores were not significantly different between the 2 groups, with 62 (91%) of the LMI group and 46 (94%) of the CMI group scoring $\geq 70\%$ (p=0.73) showing that the CMI method was also yielding good response. However, efficiency and student perception of learning significantly increased in the CMI group giving them more confidence to approach the examination[11].

Ried and Byers in order to understand the effects of a comparative model of two lecture delivery platforms in a hybrid distance education program conducted a study in the University of Florida along with the department of pharmacy. They conducted a randomized, cross over research design to compare the traditional video with a 4-panel platform (it consists of one large window on the computer screen with synchronized video and audio, transcripts of the audio narratives, power-point slides and outlines. This is followed up with a post-test questions session along with feedback and reference) among learners on multiple campuses within one college of pharmacy.

The 4-panel teaching tool is the latest and is considered as the most effective tool in teaching and training the students today. The study population 2nd year pharmacy students were divided into two groups and one group subjected to video lectures instead of the traditional live lectures and the other group was subjected to the 4-panel platform.

The results also showed that students who did well on the semester's previous two examinations scored higher on the questions related to one part of the topic (schizophrenia) while students with higher Pharmacy College Admission Test (PCAT) scores performed better on the other part of the topic (bipolar questions) when compared to students who preferred the traditional video platform showing the superiority of this model of teaching [12].

Joseph DiPiro, the editor of American Journal of Pharmacy education after having evaluated the various pharmacy education based articles that have been published in the journal, states that the ultimate endpoint of interest to the pharmacy educator should be whether students achieve desired competencies that indicate the knowledge and skills that are needed to effectively practice pharmacy. Students' own perceptions of their knowledge and skills may not reflect reality or provide an accurate and thorough assessment, and should not serve as a primary measure of learning effectiveness [13].

CONCLUSION: There is no single, best model for the education and training of pharmacists on a world-wide basis but there are common concepts, principles and practices that should be employed by pharmacy education policy-makers to meet the needs of society locally, regionally and world-wide.

In India, the profession of pharmacy has received attention from the perspective of an integral part of the health care system with the incorporation of "pharmaceutical care" being incorporated into the health care system.

The survey results from students have shown that there is a clear opportunity to enhance the current system of pharmaceutical education system with the help of information technology enabled tools like a Learning management system. This will help in meeting the goals of the student, college, university, state and the country by training the future pharmacists better to cope up with the ever advancing needs of the industry.

Such computer and web based approach/model would result in the application based learning in the area of pharmaceutics, pharmacology, pharmacognosy, medicinal chemistry, pharmachemistry, clinical pharmacy, etc. which would provide strong foundation for the students to meet the globalized industry needs in India. As shown by the review of literature, a number of universities and colleges have already started using advanced LMS as an effective tool to support the current educational curriculum in pharmacy in advanced countries.

They have also noticed that the practice of pharmacy, in the multitasking scenario, can be very demanding. This demand can be met by introducing LMS to support the current system of pharmacy education which will result in producing better pharmacists for the future that will be able to meet the industrial requirements.

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