Students' Perceptions of the Effectiveness of Teaching Aids in Construction Project Management

Bilal Zafar
IGIS, NUST, H12, Islamabad, 44000, Punjab, Pakistan

Abstract - Management is an inherent skill in every person, though people vary in their ability to explore this skill in them and execute it professionally. A sound theoretical knowledge of management is essential to explore this hidden skill and grow as a manager. The curriculum of Construction project management (CPM) is based on a variety of teaching and knowledge aids. Many topics in CPM are substantially theoretical. To optimize students' tendency to gain maximum understanding of the core concepts of CPM, it is imperative that students' perceptions are explored with respect to the effectiveness of the different teaching aids. To serve this purpose, this research identified six teaching aids through literature review, namely study of topics from books, case studies from other sources of literature, video documentaries, site visits, guest speakers, and assignments. Data was collected using a questionnaire survey and analyzed on MS-Excel 2010. Comparison of the relative importance index (RII) of the teaching aids was used to rank them from 1 to 6 ranging from the most effective to the least effective. Ranking of the six teaching aids according to their RII ranging from maximum to minimum yielded site visits as the most effective teaching aid, video documentaries as the second most effective teaching aid, study of topics from books as the third, case studies from other sources of literature as the fourth, assignments as the fifth, and guest speakers as the sixth most effective teaching aids for CPM. Curriculum and teaching method for the course of CPM based on this research can be considered as the chosen method of teaching by the students of engineering at the undergraduate level. This research offers valuable insight and useful knowledge for higher education institutions involved in the design and administration of coursework of CPM at undergraduate level.

Keywords - Construction; management; project; students; teaching

I. INTRODUCTION

Teaching CPM can be a challenging job because major part of the curriculum is theoretical, but is meant to instill practical skills in the students. Use of different teaching aids helps the teacher capture the attention of the students and invoke interest for the subject in them. Several researchers (Tatnall & Reyes, 2005; Clark, 2008) have tried to explore the best ways of teaching Project Management (PM) to students at different levels of education ranging from high-school to college. Possibly, research on teaching aids for the course of CPM at undergraduate level taught to the students of engineering disciplines is limited. This research identifies students' perceptions of the effectiveness of different teaching aids in helping them gain a firm understanding of the core concepts of CPM.

II. LITERATURE REVIEW

Importance of teaching CPM with different teaching aids

Construction project managers have to manage the constraints of time, cost, and scope throughout the life of the project and ensure that the project is delivered according to the standards of quality laid out by the client (Hamid et al., 2012). During the late 1980s, construction industry faced numerous challenges including stringent governmental regulations, increased competition, and environment-conscious populace (Agapiou, 2006). Construction industry also faced challenges associated with advancement of technology, use of new materials, and novel processes of procurement (Murray and Langford, 2005). Researchers and professional bodies recognize the importance of teaching PM, for example the ACM curriculum recognizes PM as a core area of technology (Cresswell, 2009). In response to the growing needs of the industry, many higher education institutions in the UK introduced curricula focused at the development of project management skills at both undergraduate and postgraduate level (Stansfield-Smith, 1999). Students consider the traditional theory-based approach used in classroom passive which makes them dull. Geist & Myers (2007) assert that the most suitable method for teaching PM comprises a mix of theoretical and activity-based elements. Some approaches to teaching CPM are practical while others are not. Combining different approaches to teach CPM inculcates a wider range of skills in the students. Tatnall & Reyes (2005) who have recommended a range of approaches for teaching different courses of Information System support this assertion.

Teaching aids useful for teaching CPM

One of the traditional and basic teaching aids used for teaching CPM is book. "If one wants to teach [critical chain project management] CCPM, the first problem is selecting a supporting text" (Millhiser & Szmerekovsky, 2008). However, teachers today have a variety of mediums to teach the course from in addition to books. Multimedia projectors, computers, and high-speed internet have become essential components of technology in the contemporary classrooms (Groot, 2002). Agapiou (2006) studied the use of simulation game for teaching professional practice skills to the Architecture students at undergraduate level. The objective for students in the simulation game is to manage the construction process in response to a range of events contemplated

by possible on-site scenarios. Many video documentaries help students understand core concepts of CPM using such simulation. Barron (2005) and Sense (2007) emphasize on the need for developing an environment that is conducive for better learning. Both authors advocate situational context which impart the need for the teachers to adopt a pragmatic approach to teaching CPM. The collaboration between a university and civic organizations helps the university achieve even more than the preplanned educational objectives of developing such a pragmatic approach (Brennan, 2008). Collaboration between higher education institutions and civic organizations enhances students' professional development. To foster the understanding of CPM in students, universities commonly arrange visits to the construction sites. A common practice among higher education institutions meant to enhance the understanding of particular areas of knowledge in the students is arranging guest speakers for lectures. Students tend to bridge negotiation theory and ethical frameworks with practical application when provided with an opportunity to communicate about the subject matter with experienced guest speakers and practitioners (Brennan, 2008). Assignments are among the most fundamental teaching aids used in teaching CPM. Assignments can range from mathematical problems to watching a film to observe and reflect upon the actions, behaviors, and styles of leaders and managers (Clark, 2008). Examples of such films include 'Twelve Angry Men', 'Hoosiers', and 'Master and Commander' (Clark, 2008).

III. RESEARCH METHODOLOGY

Sample

First, preliminary research carried out by other researchers was compiled and reviewed. Teaching materials and class assessments were conducted in the semester starting February 2014. A questionnaire survey was performed from the sample population of the engineering students of Institute of Geographical Information Systems (IGIS) at National University of Sciences and Technology (NUST) of the batch 2011 who are presently taking the course of CPM among others. Class strength of the Bachelors in Geoinformatics Engineering (BEGI) 2011 is 36 students. Total 36 questionnaires were distributed, but 5 had to be discarded because of incomplete responses. So the final responses included in the analysis were from 31 students. Table 1 shows the characteristics of the students. Responses included in the analysis were retrieved from 15 female students and 16 male students. Results of the questionnaire survey were compiled and analyzed. Relative importance index (RII) of the teaching aids was found using the formula used by (Zafar & Choudhry, 2012) on MS-Excel 2010. The 6 teaching aids were ranked according to students' perceptions of their effectiveness in teaching the course of CPM at undergraduate level.

Table 1 Respondents' characteristics

Gender of students	Number of respondents
Male	16
Female	15

CPM course structure

In IGIS, NUST, the class of CPM is conducted in two hours lecture followed by lab and tutorial session of three hours every week. Number of hours spent on teaching the course of CPM is three credit hours; two for theory and one for lab. The semester runs for 16 weeks normally. Theoretical lectures are taken in the class whereas hands-on activity session is conducted in the computer lab. The approach of E-Learning is frequently used to enhance students' learning through sharing the relevant course materials online. Teaching approach is based on cooperative learning. Topics in the course of CPM include but are not limited to:

- Introduction to Project Management
- Project Management Processes
- Project Scope Management
- Project Cost Management
- Project Time Management
- Project Risk Management
- Project Communication Management
- Project Human Resource Management
- Project Quality Management
- Project Integration Management
- Project Procurement Management

Software taught in the lab and tutorial sessions include Primavera Project Planner P6 and MS-Project.

IV. RESULTS OF RESEARCH

Results of research are compiled in Table 2. Total score of the teaching aid 'study of topics from books' was 105, its RII was found to be 0.677, and it was the third most effective teaching aid. Total score of the teaching aid 'case studies from other sources of literature' was 102, its RII was 0.658, and its rank among the six teaching aids according to level of effectiveness as perceived by the students was 4th. Total score of the teaching aid 'video documentaries' was 124, its RII was found to be 0.8, and its rank was 2nd. Total score of the teaching aid 'site visits' was 132, its RII was 0.851, and this was found to be the most effective teaching aid as per students' perceptions. Total score of the teaching aid 'guest speakers' was found to be 92, its RII was 0.593, and students considered it as the least effective teaching aid for the course of CPM. Total score of the teaching aid 'assignments' was 100, its RII was 0.645, and students considered it the 5th most effective teaching aid for the course of CPM.

Table 2. RII and rank of teaching aids for the course of CPM

Teaching aids	Total score	RII	Rank
Study of topics from books	105	0.677	3
Case studies from other sources of literature	102	0.658	4
Video documentaries	124	0.8	2
Site visits	132	0.851	1
Guest speakers	92	0.593	6
Assignments	100	0.645	5

V. DISCUSSION

Site visits

With a RII of 0.851, site visits was recognized as the most effective teaching aid for the course of CPM. Students' overwhelming interest in site visits as a teaching aid is not surprising because site visits not only provide students with an opportunity to have a detailed insight into practical CPM processes of a real-life project, but also serves as a break from the traditional method of teaching in the classroom. Site visits help the students develop holistic understanding of CPM processes because they are briefed over all aspects of management and are offered an opportunity to witness the processes being executed on-site. Students tend to remember the concepts developed on site visits longer because of the memories associated with the trip. In addition, many students find site visits to be of recreational significance as well, which makes site visits even more valuable as teaching aids.

Video documentaries

Students identified video documentaries as a very effective teaching aid. Therefore, they ranked video documentaries as the second most effective teaching aid for the course of CPM, with a RII of 0.8. Enriched with the power of the moving image, wonderful graphics, simulation, and sound effects, video documentaries have an edge over the traditional sources of information that exist in the form of textual literature and are deprived of these effects. Many students find video documentaries as wonderful teaching aids because they lend a theatrical touch to the classroom environment. With the facility of information technology, high-speed Internet, and multimedia devices, it has become very feasible for teachers to accommodate video documentaries in their lectures to capture the interest and engagement of the students.

Study of topics from books

Despite the surfacing of new kinds of sources of information, the effectiveness of books in inculcating the concepts of CPM in students cannot be underestimated. This is why students ranked study of topics from book as the third most effective teaching aid for the course of CPM, assigning it a RII of 0.677. Students included in this research studied project management from Project Management Body of Knowledge (PMBOK). In addition, some other books were also taught for particular topics of CPM including scheduling and cost estimation. Students deem books as effective teaching aid because they find it convenient to read from books. Students can read books anywhere and at any time they want, without having to deal with the constraints of battery-life, electricity, or charging. Besides, students find it easier to take notes from books, highlight important lines and passages, and mark particular pages on books compared to other sources of reading like iPads or computers.

Case studies from other sources of literature

With a RII of 0.658, case studies from other sources of literature were recognized as the fourth most effective teaching aid for the course of CPM. Other sources of literature include information over the Internet, pamphlets, journal articles, blogs, magazines, and newsletters. Students included in this research were demonstrated concepts through practical case studies of projects. It is recommendable for the teachers of CPM to frequently include such other sources of literature in the lecture because having written by different authors, these variety of sources of information provide the students with varying perspectives and opinions over a concept, thus invoking their critical thinking skills.

Assignments

Students assigned assignments a RII of 0.645 and ranked them as the fifth most effective teaching aid for the course of CPM. Assignments derive their importance as teaching aid from the fact that they require students to make effort on individual level and practically solve the cases presented using their concepts and knowledge gained in the class. While teachers can make assignments a very effective teaching aid depending upon the level of complexity of the assignment, its level of suitability for the students, and its assigned weightage in students' performance assessment, assignments are generally not very popular among the students because assignments are essentially homework. Students are expected to complete their assignments on their own using the concepts learned in the class. Teachers can enhance students' interest in the assignments by presenting students with interesting and realistic problem scenarios with a moderate level of complexity.

Guest speakers

Students assigned the lowest rank to guest speakers in terms of their effectiveness as teaching aid for the course of CPM. Therefore, the RII for guest speakers was found to be 0.593. While guest speakers are very good sources of information, students' perspectives on their use as teaching aid might be linked with factors other than the competence of the guest speakers. The kind of setting in which guest speakers deliver lectures might not be conducive for learning for some students. Most guest speaker lectures are arranged in large auditoriums and capacious halls to accommodate a wide population of students. With too many

students and very few faculty members being present in a large hall, students are left on their own to gain knowledge from the guest speaker. Students might also underestimate the importance of guest speaker lectures because many of these lectures have just educational significance, and do not make part of the assessment of students' academic performance.

VI. CONCLUSION

This research was conducted to study students' perceptions of the effectiveness of different teaching aids used for the course of CPM at undergraduate level. Six teaching aids identified through literature review were study of topics from books, case studies from other sources of literature, video documentaries, site visits, guest speakers, and assignments. When ranked according to their RII, teaching aids for the course of CPM ranged from most effective to least effective as site visits, video documentaries, study of topics from books, case studies from other sources of literature, assignments, and guest speakers. This leads to the conclusion that to enhance students' tendency to learn in the course of CPM at undergraduate level, universities should frequently arrange site visits for the students. Informative and valuable video documentaries should be identified, accessed, and made part of the curriculum before the commencement of the course. In addition to selecting the most useful and informative textbooks, university administration should ensure the provision of fully operative and advanced IT in the classroom to provide the teacher with a range of platforms and mediums for teaching. Knowledge created with this research is particularly useful for higher education institutions that design course curriculum for CPM and others that teach that curriculum to the students at undergraduate level. This research also offers useful insights for project managers who want to equip construction personnel with the managerial skills through on-site training.

VII. REFERENCES

[1] Agapiou, A. (2006). The Use and Evaluation of a Simulation Game to Teach Professional Practice Skills to undergraduate Architecture Students. *Journal for Education in the Built Environment*, *1*(2), 3-14.

[2] Barron, S. (2005). Assessing Project Management Learning – how can it make a difference?, 2nd Project Management Conference: Excellence in Teaching, Learning and Assessment, Bournemouth,15 – 16 September, 2005.

[3] Brennan, L. L. (2008). Reaching Beyond the Classroom to Virtual Mentors. *Transformative Dialogues: Teaching & Learning Journal*, *2*(2), 1-12.

[4] Clark, R. (2008). Project Management: The Key to Engineering Employability, SEFI - 36th Annual Conference, Aalborg, Denmark, 2 - 5 July, 2008.

[5] Cresswell, J. W. (2009). *Research Design Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Inc. USA.

[6] Geist, D. B., & Myers, M. E. (2007). Pedagogy and Project Management: Should You Practice What You Preach?, in Southeastern Conference of Consortium for Computing Sciences in Colleges.

[7] Groot, M. (2002). Multimedia Projectors: A Key Component in the Classroom of the Future. *T.H.E. Journal Online: Technological Horizons in Education*. Retrieved 12 April 2014 from http://atto.buffalo.edu/registered/ATBasics/Populations/UDesign/multi2.pdf.

[8] Hamid, S. A. R., Ghafoor, H. A., & Shah, T. Z. (2012). Work Environment and its Impact on Triple Constraint of Project Management. *Information Management and Business Review*, *4*(10), 545-552.

[9] Millhiser, W. P., & Szmerekovsky, J. G. (2008). *Teaching critical chain project management: an academic debate, open research questions, numerical examples and counterarguments*. Working Paper. Retrieved 12 April 2014 from http://blsciblogs.baruch.cuny.edu/millhiser/files/2008/10/teaching-ccpm-millhiser-and-szmerekovsky-2008.pdf.

[10] Murray, M. & Langford, D. (2005). *Architect's handbook of Construction Project Management*. London: RIBA Enterprises.

[11] Sense, A. (2007). Structuring the project environment for learning. *International Journal of Project Management*, *25*, 405-412.

[12] Stansfield-Smith, C. (1999). *Review of Architecture Education*. London: RIBA.

[13] Tatnall, A., & Reyes, G. (2005). Teaching IT Project Management to Postgraduate Business Students: A Practical Approach. *Journal of Information Technology Education*, *4*, 153-166.

[14] Zafar, B., & Choudhry, R. M. (2012). Factors affecting competency of masons in construction, Creative Construction Conference 2012, June 30 – July 3, 2012. pp. 752-759.