

Distance Learning Applicability in Egyptian Construction Engineering Education

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Abstract—The research is based on answering the question about the possibility of applying the philosophy of distance learning in the Egyptian construction engineering education. It was concluded that, most students were more satisfied in face-to-face and written communication with teaching assistants, in addition other students through written and voice communication, besides they would like to receive their courses within off-campus notes, recorded lectures and classes attendance.

Keywords—Distance learning form; construction; semi student centered

1 Introduction

In traditional leaning, students rely on in-person meetings at the campus to receive their education and interact with others [28], there is another system of education called distance learning that is a way of learning designed to be carried out remotely when the instructor and student are separated geographically in which each of them is in different place. The separation can also be in time when communicating at different times therefore it may combine both place and time [4, 11]. With increasing prices distance learning is considered cost effective education and economically viable option without worries about commuting and on-campus fees.

The expression “distance education” or “distance learning” hasn’t one clear-cut definition that is universally accepted. It also includes many various terms, for example, correspondence study, off-campus learning, independent study, home study, external study, remote learning, distributed instruction or distance teaching. Despite the difficulty to find a unified term of distance learning, the ideas contributing this educational milieu are similar [17].

Currently, many distance learning types emerged, as the technology evolved, ranging from simple mail to the use of high technology where the curriculum delivered through the Internet and communication occurs via synchronous and asynchronous medium. This education has plethora of modes which can be used singularly or integrated to create distance learning environment as:

1. Correspondence learning: is the first form of distance learning where students receive printed study materials via the post
2. Broadcast learning: these courses can be taken by listening to radio and watching TV programs at home [16, 20]
3. Web-enhanced: traditional courses that have some online activities as doing research or providing videos that enhance the classroom [20, 28]
4. Online learning: It rely on the Internet to mediate learning content and interaction without going to a physical classroom more than 20% [20]
5. Hybrid or blended learning: between 25% - 50% of courses are taught distance and the remaining 50% -75% part in traditional setting, so it takes best features of each learning system [16, 24, 30]
6. E-learning: the learning process that includes electronic technology as videos, CDs, DVDs, online tools which essentially requires using the computer to receive information and for interaction
7. M-learning: it involves learning through handheld devices, including smart phones or tablets [8, 30]
8. U-learning: in ubiquitous learning, computers with sensors around learners transfer data to their handled devices via wireless or Bluetooth [26]
9. Virtual learning: is a 3D environment emulating the real world which allows students to participate through text or audio using software programs [14]. Users can register and represent as avatar for example, Second Life or Active Worlds [6].

The technologies used in distance learning can be divided into two types: synchronous and asynchronous. Synchronous distance learning occurs when all participants interact, ask questions, and collaborate at the same time in different places. It involves multimedia components such as Internet relay chat and audio/video conference [18,29]. On the other side, asynchronous learning can be carried out while interaction isn't in real time. Examples of asynchronous technology types can be printed material, instructional television, CD-ROM, e-mail, bulletin board and pre-recorded audio/video [29]. There is also a digital platform called learning management system (LMS) offering both synchronous and asynchronous learning. It enables instructors to share course content, monitor and organize the process [10, 15, 27]. Also, assists students to learn, communicate, collaborate and to submit assignments. Moodle, Blackboard and Sakai are examples of LMS several options [2,13].

Distance learning distinguishes face-to-face learning by the separation between lecturers and students; therefore, students must be more self-directed than in conventional classroom environment. It is suitable for students who can study without guidance and have time management skills. This separation needs involvement of media to unite instructors and learners, also for carry course content, that requires students to have basic technology skills [1, 23]. In addition, it solves time and scheduling problems for whose lifestyle is busy through the provision of two-way communication and students will have more opportunities for self-enrichment and lifelong learning [9, 21].

This system of education gives more flexibility in time than traditional education as students are not obliged to travel daily to the campus, so they can study at any time

according to their daily plans in any preferred place, also instructions can be taken from the lecturers and interact with others [4]. Distance learning courses are ideal for students who are unable to attend university regularly as well as for who want to improve their skills or work alongside their study [5]. It also gives good value for affordable money because student doesn't need to pay the university costs such as travel bills, meal plans and institutions don't have to provide accommodation for students besides constructing new educational buildings.

This learning contains at least eight contributing elements to be applied. At first, is physical distance between learners and lecturers as the most obvious component. Second, the student who will receive the education, and third, the teacher who responsible for teaching students [12, 22, 25]. Fourth, the course materials as the source of information. Consequently, the fifth element, is the medium to transfer instructions which can be divided into four categories (print, audio, computer (data) and video) [19]. Sixth, the interaction electronic tools like (discussion forums, e-mail, chat, audio and videoconference) to communicate with staff and students. Seventh, the organization to provide the content where the educational process under the name of it. Finally, the measurement of students' progress and outcomes [16].

2 Study Objectives

This study was an attempt to provide in depth examination if distance learning is needed in the Egyptian construction engineering environment. It is guided by the following objectives:

1. Evaluating the effectiveness of the current learning environment by conducting a comprehensive investigation of students' outcomes such as behavior, performance, satisfaction.
2. Creating an appropriate form for implementing distance learning program by using the research results related to particular needs.

3 Traditional Engineering Education in Egyptian Universities

The bachelor's degree in engineering requires passing 5 studying years starting from the preliminary year. Based on the total GPA in this year, students can determine in which department will be during the next four years. Each year is divided into a first semester that ends with mid-year exams and a second semester ends with final exams. In the middle and either before the end of each semester, midterm and oral exams are held sequentially. The educational process is carried out on the campus in Faculty of Engineering buildings where staff deliver the curriculum to students. Students receive their education from two sources at the university. Firstly, in lectures where the lecturer teaches the scientific material with simple practical examples. Secondly, in classes where the teaching assistant is explaining with solution to many examples and exercises and sometimes the classes can be in the engineering laboratories to apply the practical parts to reality. At least 75% of the lectures and classes

should be attended by students. Without convincing reasons for absence, student will be denied entry into the oral, midyear and final exams. Students go to the campus every day except Fridays, with a maximum of 8:30 am to 5:00 pm for one and a half hour per lecture or class and ten minutes break between each. Students basically rely on a third source to study outside the university written by teaching assistant which called off-campus notes. They are printed paper that contains curriculum explanations with several practical exercises.

4 Sample Size and Instrument

To get the most representative sample possible, the survey was randomly distributed. Data were gathered from 600 undergraduate and post graduate construction engineering students to be used in data collection using three forms including web survey, paper questionnaire, and interview questions. During the second semester of 2017-2018 the survey was administrated. First one is an online survey which was sent to El Shorouk Academy students in Google drive with 150 answers. Respondents entered their responses directly into the survey and the input automatically stored. Second survey is a questionnaire, and was distributed randomly among Zagazig University students with 450 answers. Face-to-face interviews were taken with a sample of students to gather their opinions and impressions about the survey. The used descriptive statistics software (i.e., Microsoft Excel and SPSS) to analyze data included validity and percentages.

5 Methodology

The research is quantitative and qualitative study of the learners' perceptions of their education positives, negatives and barriers to apply a possible improvement. There were altogether close ended questions most of them had an open choice to express the reason for their answer. The questionnaire was divided into eight groups which each group contains factors which concern their group (see Table 1).

Table 1. Surveyed Factors

Group No.	Factor No.	Suggested Factors	Group No.	Factor No.	Suggested Factors
A	Students' Demographics		F	Interaction Rate	
	A.1	Gender		F.1	Lecturers
	A.2	Education level		F.2	Teaching Assistants
A.3	Grades	F.3		Close Students	
B	Transportation and Study		G	F.4	Other Students
	B.1	Travel Time		Benefit Rate	
B.2	Study Time	G.1		Lectures	
C	Education Expenses		G.2	Classes	
	C.1	Ability to Pay Expenses	G.3	Off-Campus Notes	
D	Study Skills Factor		H	Proposed Distance Form	
	C.2	Satisfaction for Expenses		H.1	Recorded Lectures and Classes
E	D.1	Shyness and activity		H.2	Material Delivery
	Attendance Rate		H.3	Communication Methods	
	E.1	Lectures			
	E.2	Classes			
	E.3	Off-Campus Courses			

Demographic questions to ensure the survey is comprehensive, reflecting the views of various students and data collection will properly be implemented.

Next factors reflect the participants' current transportation hours to go to the university (one way) and the frequency of day-to-day studying time. A long-time of transit can increase psychological problems like stress and depression, whereas short transit time is causing higher concentration in lectures and classes. It is expected that increasing study time has a positive impact on confidence and productivity then lead to increase academic achievements thereby the reducing of time constraints is appreciated.

The study provides information about students' attitudes towards paying for college to ensure if it meets their everyday needs over long periods and to essentially know what students have to say about their financial situation. There is always risk that participants are speeding without actually looking at the content of the survey, so this question "To what extent are you satisfied with paying university expenses?" is designed as a trap question to get more accurate, nuanced answers for the previous question.

Question eight is to measure the proportion of activity and shyness among college students. Not all students find it easy to take an active role, so results will create environment that help students of various learning behaviours and personalities to contribute.

Next dimension covers attendance rates in three items lectures, classes and off-campus courses, in addition offering students an opportunity to reveal their reasons for attendance and absenteeism.

Communication question focuses on investigating students' preferences in interactions with each of lecturer, teaching assistant, close students and other students as a remedial measure to create conditions to facilitate interaction and ease communication.

The survey asks students to rate their benefit from each of lectures, classes and notes outside campus as the most and least reliable beneficial source to study from. This evaluation can be valuable in helping and making appropriate changes to improve and refine their learning.

As multimedia technologies are heavily used in distance learning [31], the available bandwidth and efficiency of Internet will have a great impact on the delivery and interaction modes. Distance education courses contain various forms so it was taking into consideration low speed connection and data transfer rate in Egypt when develop distance part of questionnaire.

Distance learning questions are to determine the appropriate material delivery modes and the ways of communication from students' Perspective. First question offers students features as recorded lectures and classes to be more interactive with course content through learning any time, any place, and any pace. This can help them manage their time, thereby the delivery can increase motivation and productivity, as well as make learning more efficient.

Second question provides perceptions of pedagogical delivery offered by different ways that expand the range of delivery which lead to increase learning capacity and ease of access to content for acquiring more knowledge.

The last question asks students to identify the degree of interaction with lecturer, teaching assistant and other students within verity choices in time and place of interaction as face-to-face, written and voice communication. The results will show the most productive relationships in reducing self-consciousness and encouraging discussion.

6 Data Analysis

Collected data showed female participants about 18.5% and males about 81.5%. Females students are about less than 25% of total students so results are convergent with little variation because some of them weren't enthusiastic about the questionnaire unlike male students.

Only 8.7% of the sample were in Preliminary-year, while 11.8% of them were in First-year. Second-year students were with response rate 21.2%. About 24% of students were in Third-year and Fourth-year students were 28%. The remaining 6.3% were postgraduate students. It is obvious that post graduate students less than undergraduate because students who enrolled in construction post graduate studies are few, so the results represent the views of all students not limited to one class.

Students who reported on their degrees, 38.4% were good, 31.7% acceptable, 26.8% very good, 3.1% excellent. It was found the high majority their grading was acceptable and good. In addition, variation in students' grades is founded, which mean a variety sample of students are surveyed and it is needed to improve student's chances for higher grades.

Almost third of students 28.8%, 28.6% their travel time was 2-3 hours and for 1-2 hours. 28.5% reported travelling less than hour. Student who travelled more than three hours were 14.1%. Most students spend a lot of time on travel that affects their university experience and translate into significant time away from family, extracurricular activities and study therefore reducing travel time will have positive effect on them by providing extra time.

Respondents who study in few days and before midterm and final exams were 44.5%, While 24.5% can study before midterm and final exams only and 19.5% study in many days and before midterm and final exams. Students who study daily after going home were 11.5%. The result showed that students struggle more with time management. This could influence students' outcomes and decline their academic performance, therefore without sufficient time student's grades obviously will suffer.

To the whole sample showed that, 29.6% can afford part of the expenses, and then 24.5% can easily pay all expenses. 23.6% can hardly provide personal and transportation expenses. The last 22.3% save in personal expenses to pay for transportation. Less than a quarter of the sample can easily pay all expenses, the impact of this on broader student welfare is clear causes money worries on their mind and adversely affects their studies. With rocketing costs, the faculty is a full-time occupation and it is hard to find a time to get a part time job.

About 33.7% of students' satisfaction rate was 25-50%, while 29.5% satisfied by 0-25%. Only 27.1% chose their satisfaction by 50-75%. The least percentage was 9.7% with a rate 75-100%. Here we can see over 63.2% their satisfaction was less than 50% and 36.8% of students who satisfied to pay university expenses by more than 50%. The result in this question is almost the same in the previous one, so individuals who are cheating as they take the survey only a small proportion. This study revealed that college costs were rising beyond the reach of families, so changes to affordability policies needs to occur.

Of the respondents 44.2% liked studying on their own and asking questions when they find a problem in the study. 31.1% of the recipients said that they prefer interaction, asking questions, discussion and team work with others in campus. Students who feel shy to interact, ask questions, discuss and teamwork with others in campus were 24.7%. According to the results the majority of respondents feel shy to interact with others and like studying on their own, while one third of them prefer interaction and team work. The ability to discuss ideas and team work with fellow participants was an aspect of learning that may be absent in current learning environment.

More than one third 32.4% of the students attended 75-100% of lectures. Convergent rates 26.7% and 22.5% attend 0-25% and 50-75%. The last 18.4% attend 25-50%. The majority 58% of the students attend 75-100% of classes. Then 24.4% of them attend 50-75%. Whereas 9.8% and 7.8% attended by a rate 25-50% and 0-25%. In off-campus courses 65.8% of the participants reported their attendance by 0-25% followed by convergent rates 15.7% and 12.2% chose their attendance 75-100% and 25-50%. Last percent 6.3% their attendance was 50-75%. By looking at the previous percentages we can notice that the highest rate for attending more than 50% was for classes 82.4% followed by lectures 54.9% and the lowest for off-campus courses 22%. They expressed that classes satisfy their requirements, are an efficient way to keep motivated and listening because they summarize course and identify the important points and deliver a large quantity of information in greater depth. Although more than half of participants attended lectures in high rates, many of them attended because the fear of being penalized from exams and to only get the full attendance marks.

Overall, 43.6% of students their interaction rate with lecturer was 0-25%, then 30.8% and 20.3% interacted by 25-50% and 50-75%. Finally, 5.3% interacted by 75-100%. 50-75% of teaching assistant interaction rate chosen by 39.5% of students, while 26.2% interacted by 75-100%. 19.7% of them interacted by a rate 25-50%. 14.6% reported that their interaction was 0-25%. For close students, 56.7% gave a response rate of 75-100% and 29.9% chose 50-75%. Followed by 9.4% with interaction rate 25-50%. Last 4% their interaction was 0-25%. The last item with other students, 0-25% interaction rate chosen by 34.5%, then 30.3% of them liked to interact by 25-50%. Whereas 26.1% their interaction 50-75% and 9.1% with a rate 75-100%. Here we can see the highest interaction rate with close students 86.6% more than 50%, followed by teaching assistant 65.7%, then other students 35.2% and the last with lecturers 25.6%. Learners mentioned that they built productive relationships with their close friends, enjoy contacting each other, and prefer to participate in discussions among them. Interaction with teaching assistant was high because small age difference made convergence in ideas and encouraged students to interact. In addition, participants find teaching assistant can draw their attention and interact with them in friendly way. Several participants don't prefer communication with other students because they don't trust them and the relation is not strong enough. Students experience with interaction with lecturers was the lowest rate. A number of them don't like interaction because they feel shy in public interaction and embarrassed of asking questions.

In lectures 36.3% and 34.2% of students benefit percentages was 0-25% and 25-50%. Almost 23% benefited by 50-75%. The last 6.5% chose their benefit by 75-100%. Followed by classes, approximately half of students answers 47.4% was 50-75%, then 27.5% chose a benefit rate 75-100%. 18% their choice was 25-50% and 7.1% benefit rate was 0-25%. Then off-campus courses, 75-100% chosen by 54.8% of students. 28% benefited by 50-70%. The last two proportions 9.6% and 6.6% their benefit was 25-50% and 0-25%. It is obvious that students benefit more from off-campus notes 78.2% then classes 70.8% and the least benefit from lectures 27.8%. They said, notes have beneficial explanation much better than books, increase their ability to absorb information, confidence and productivity. Also, meet their needs and expectations because they are well organized, summarized and contain the important points. Classes helps them to increase the understanding of information, restoring what the lecturer said, compensate the missing in lectures, reducing the study time and explains information without complexity. The lowest benefit rate was in lectures. Many students found complications in understanding due to low quality, feeling bored and losing their attention. They also gain no benefit due to quick, complex and unclear explanation.

Results of distance learning part indicated that, the highest proportion 55.4% of respondents preferred both lectures and classes to be recorded followed by 22.1% chose campus attendance and 16.7% want lectures only to be recorded then 5.8% preferred classes only to be recorded. The results from both first and second questions was linked together to determine the most preference ways of course delivery. The high majority of students who chose recorded lectures and classes preferred in next question studying from off-campus notes 24%, followed by 19% recorded lectures and

classes again. Studying traditionally from lectures and classes was 11% and 17%. Recorded lectures and classes' attendance were 16%, and then the least choices were on social groups and recorded classes and lectures attendance. According to views, off-campus notes serve the primary source of instructions to most students. They are very comfortable using notes to learn as the easiest source to study from also saving their time and efforts. Students mentioned the usefulness of video is improving comprehension in ability to repeat as many times as they need will give time to look up anything, they are unsure, listen to a lecture and make notes at the same time. This helps to overcome obstacles as noises, high temperature, choke due to large lectures attendance numbers, students can listen when they are at their best, no missed lectures due to illness or timetable clashes. Classes help students in gain a better knowledge on a topic better, short-term understanding as they promote relaxed and comfortable environment, clarify the unclear topic right away, explains a topic and solves its example questions in detail. In the final question, face-to-face communication with teaching assistant chosen by 47% of respondents and 29% liked to interact with lecturer followed by 24% preferred other students. In written communication 39% of students chose both teaching assistant and other student whereas 22% their choice was lecturer. More than half 55% of students wished voice communication programs with other students, while 33% liked communication with teaching assistant. 12% chose lecturer. They expressed teaching assistant allows interaction with him at any time at campus, provide academic advice to students if they are having problems that interfere with their ability to study effectively. Students found written communication promotes time flexible where they can be involved in the same activity at a suitable time and place. In vocal interaction students can easily interact with their peers and receive timely feedback it also gives students chance to be active especially for who inhibited from asking questions in front of such a large group.

In distance learning analysis, answers reflected strong preferences in face-to-face interaction between students and teaching assistant. In written interaction they chose other students and teaching assistant the most. Finally, interaction through voice communication they select their peers. In traditional setting, students also indicated the highest rates in face-to-face interaction with teaching assistant, attending classes and off-campus notes that serve the primary source of instruction to most students. Subsequently, the most useful course delivery items can include recorded lectures, classes attendance and notes. According to results, attendance rate will reduce by 50%, as well costs through providing recorded lectures and only classes attendance. Also, attending exams and laboratories will be compulsory at campus. Beside distance components in written communication with other students and teaching assistant, voice communication with other students, the faculty has to provide students with notes that include simple, clear, easy and full explanation with several ideas and exercises (see Table 2). It is also possible to provide contacting with lecturers on a monthly basis for inquiries and discussions, as they are the writers of scientific materials and exams makers.

Table 2. Value Assessment Analysis

		Outcomes%		Cost	
		Traditional Learning	Distance Learning	Faculty	Student
Information Delivery	Classes and Labs	100%	-	100%	100%
	Recorded Lectures	-	100%	-	-
Communication & Feedback	Notes	-	100%	-	100%
	Face-to-Face	50%	-	50%	50%
Evaluation	Written	-	100%	-	-
	Voice	-	100%	-	-
	Oral and Practical Exams	100%	-	100%	100%

Based on information gathered from students, the results will help to increase flexibility added by the distance component through save time in transportation, omit attending unnecessary sessions, low personal and travel costs, overcome fears of social interaction, join classmate’s discussion at any hour, fit study with restricted schedule, give the ability to gain more extensive information. As such, identifying expectations of students or their perceptions concerning distance learning can provide educational experiences with valuable effective tool for enhancing satisfaction and thus avoid resulting negative outcomes (see Table 3).

Table 3. Value Engineering Analysis

	Travel hours	Study hours	Costs	Save Time	Interaction Rate	Benefit Rate	Satisfaction Rate	Grades
Traditional Learning	Higher	Higher	Higher	Lower	Lower	Lower	Lower	Lower
Hybrid Learning	Lower	Lower	Lower	Higher	Higher	Higher	Higher	Higher

The resulted hybrid form is considered a shift from the instructor centered to more semi student centered learning (see Figure 1). It is more likely to merge student centered approaches in the teacher centered environment, where “teachers become mentors and facilitators instead of directors and lecturers” [7] as follow:

1. Instructors’ notes and lectures are the source of information. (T.C)
2. Instructors evaluate students learning through periodically midterm, oral and final exams. (T.C)
3. Students address questions in discussions and share ideas and thoughts, depend on their preferences. (S.C)
4. More interactivity in communication between students and instructors or class mates. (S.C)

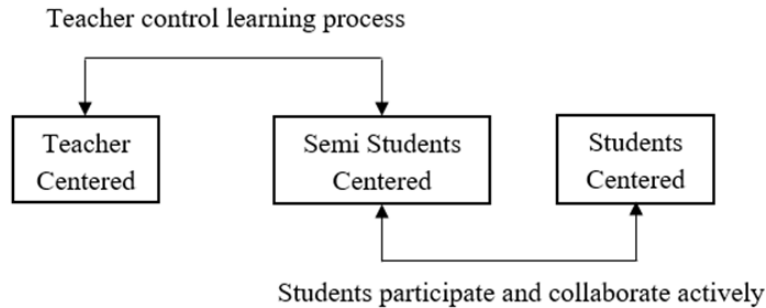


Fig. 1. Semi Student Centered Diagram

7 Conclusion

From the statistical results of traditional learning evaluation, improvements were recommended through hybrid distance learning as an effective learning environment. The proposed form was compiled and examined to find out: (1) students' preferences associated with course delivery methods and (2) students' envisions for the use of communication technologies with others.

Some factors restrict the implementation of distance learning in the Egyptian environment such as: lack of a strong telecommunication infrastructure, shortage of technical staff, cultural resistance to change, financial matters, lack of government interest and policies [3].

Proposed form is offered to engineering students in a mix of hybrid formats in both written and voice communication, printed notes and recorded lectures as well as in face-to-face communication in classes (see Figure 2). Distance tools reduced travel time also prevents undue expenses on travelling in addition to allow more flexible schedule which fit their life as they don't have to drive to campus or waste time by sitting in lectures for long hours. Besides, those with handicaps or sicknesses to find learning option suits their personal needs. With adequate time and costs, it offers students access to the resources, knowledge and transferable experiences, uniquely balance stud, campus and family life in an environment that better suits their lives.

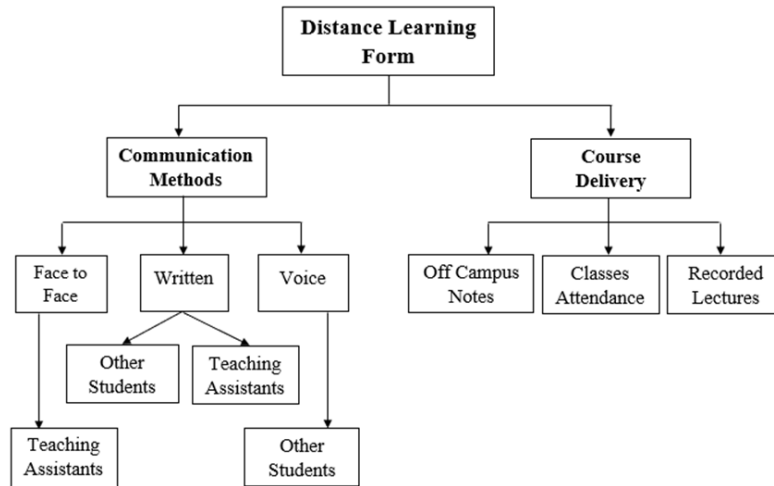


Fig. 2. Distance Learning Form

8 Recommendation

The resulting data can be used to justify and develop the preferred learning form which suggests ways to affect student success positively. In addition, leading to better achieving educational goals by responding to students' needs. As a result, this study can better inform current institutions make decisions to apply standardized enhancements distance learning programs through:

1. The application is carried out at this preliminary stage on one or two construction management courses to evaluate the results in preparation for generalizing them.
2. It is proposed to start the application in the first semester of the academic year 2020-2021, which provides an opportunity to prepare the required.
3. Students who take the same course are randomly divided into two groups almost equal in number.
4. The first group will be taught by traditional way and the second group by hybrid distance learning method.
5. Evaluation is done periodically during and at the end of the semester using questionnaire forms, periodic and final exams.
6. The evaluation will address the comparison of efficiency between the following factors:
 - a) The administrative, organizational and economic process.
 - b) The educational process.

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