

Enhancement of Quality Teaching and Learning Process Based on ISO 9000 of Senior in Undergraduate Public Health Education

Dusanee Suttapreyasri

ABSTRACT

The objective of this study was to set up a quality assurance system for the teaching/learning process in the classrooms of the Faculty of Public Health, Mahidol University.

Seventy-four students from 3 bachelor programs and eight faculty members participated voluntarily in this study, which was divided into 3 phases: preparation phase, class-room phase and in-depth interview phase. A new curriculum entitled ISO 9000 was developed, including learning objectives, lesson plan, pre-and post-tests and final evaluation. A quality manual for teaching/learning ISO 9000 and course instruction procedures were written in accordance with the principles of ISO. Teaching and learning activities were implemented as jointly planned. The reliability of the final evaluation questionnaire was 0.93

It was found that students and teachers expressed satisfaction with the quality assurance of the teaching/learning process. Low-compliance was due to time-constraints in the arrangement under a voluntary-basis. A documented curriculum, learning materials, lesson plan, and evaluation forms were the benefits of this study, in addition to the performance criteria for the measurement of quality of a teaching/learning process. Quality education through self-evaluation and peer-review require individuals and groups to be open, honest and to have an increased level of professional accountability.

Introduction

Higher education in Thailand has had an important role in national human resources development and leading society. The Faculty of Public Health, established in 1948, is one of the thirteen faculties of Mahidol University. It comprises 13 departments with 169 teaching staff in 1997. It is housed in 6 modern buildings with well-equipped classrooms, laboratories, conference facilities and one library, including an audio-visual production unit, learning resources and computer rooms. The Faculty offers all levels of academic programs, such as bachelor, master, doctoral and graduate certificate programs, covering both Thai and international students. For the bachelor degree programs, there are 7 major areas of concentration: Community Health, Environmental Sciences, Health Administration, Health Education, Occupational Health and Safety, Nutrition, and Food and Nutrition. The admission and graduation requirements must meet the standards set by the Ministry of University Affairs. There were 487 male and 576 female students in 1997, of which 164, 154, 135 and 118 students are the numbers of students in the first to the fourth academic years.

Many prominent and distinguished persons, such as former Prime Minister, Mr Anand Panyarachun, senior citizen-Professor Praves Vasi and the former Rector of Mahidol University, Clinical Professor Pradit Charoenthaithawee, have pointed out that Thai universities have a low standard quality education. A study on the production efficiency in higher education showed that the social economic rate of return was low and that there was inequity in governmental resource distribution. The longterm plan for higher education, 1990-2004, suggested that partnership between government, universities and the private sector with efficient financial management. The increased demand for agro-industry manpower is expected, and the need for accelerated production of quality education has been accepted. Quality assurance in higher education has been proposed, since the declaration of the policy on July 8, 1996. The transfer of industrial standardization, such as ISO 9000, BS 5750, to be educational standardization, has been applied. The reform of higher education is projected to be fully functioning in 2002. The objective of this study was to set up a quality assurance system on the teaching /learning process at the classroom level, among the senior students of the bachelor programs in the Faculty of Public Health, Mahidol University.

Material and method. The research was divided into 3 phases:

1. Preparatory phase: Eight faculty members and seventy-four seniors of 3 under-graduate programs: Environmental Sciences (19), Occupational Health & Safety (45) and Nutrition and Dietetics (10), voluntarily participated in this study

after promotion of a new course, entitled ISO 9000, by their teachers in the second trimester of the academic year 1997-1998. The students, who had the same educational qualifications, signed their names to participate in studying ISO 9000, jointly made their decision with their teachers for the topics and content that they wanted. A new curriculum on ISO 9000 using the ISO approach was developed, including learning objectives, lesson plan, pre-and post-test and final evaluation. A quality system was set up (Figure 1) A quality manual, course instruction, and the audit for teaching/ learning on ISO 9000 were approved by all concerned.

One expert on Material Science Engineering provided the details of the ISO subject matters to the research team and teaching staff involved in this study. The teaching and learning process of individual programs was implemented independently with the same manual and instruction. The reliability of the evaluation form was 0.93.

The teaching content consisted of 6 units as follow :

- Unit 1 The history of quality assurance system in industry
- Unit 2 Basic requirement for International Organization for Standardization 9000 series
- Unit 3 Entry to ISO 9000
- Unit 4 Internal quality audit.
- Unit 5 Certification and maintenance of QA system
- Unit 6 Quality education in higher education in Thailand.

Statistical analysis

Mean and standard deviation were used in descriptive analysis, while paired t-test and Analysis of Variance of the means and mean-differences (one-way ANOVA) were used for analytical analysis.

2. The comparative study phase: A quasi-experimental design of three groups of students in different educational programs, as already mentioned, was implemented. Pre-and post-tests with final evaluation were conducted at each session and at the end of the course.

3. An indepth interview with involved teachers and students on their satisfaction related to quality teaching/learning process, was conducted.

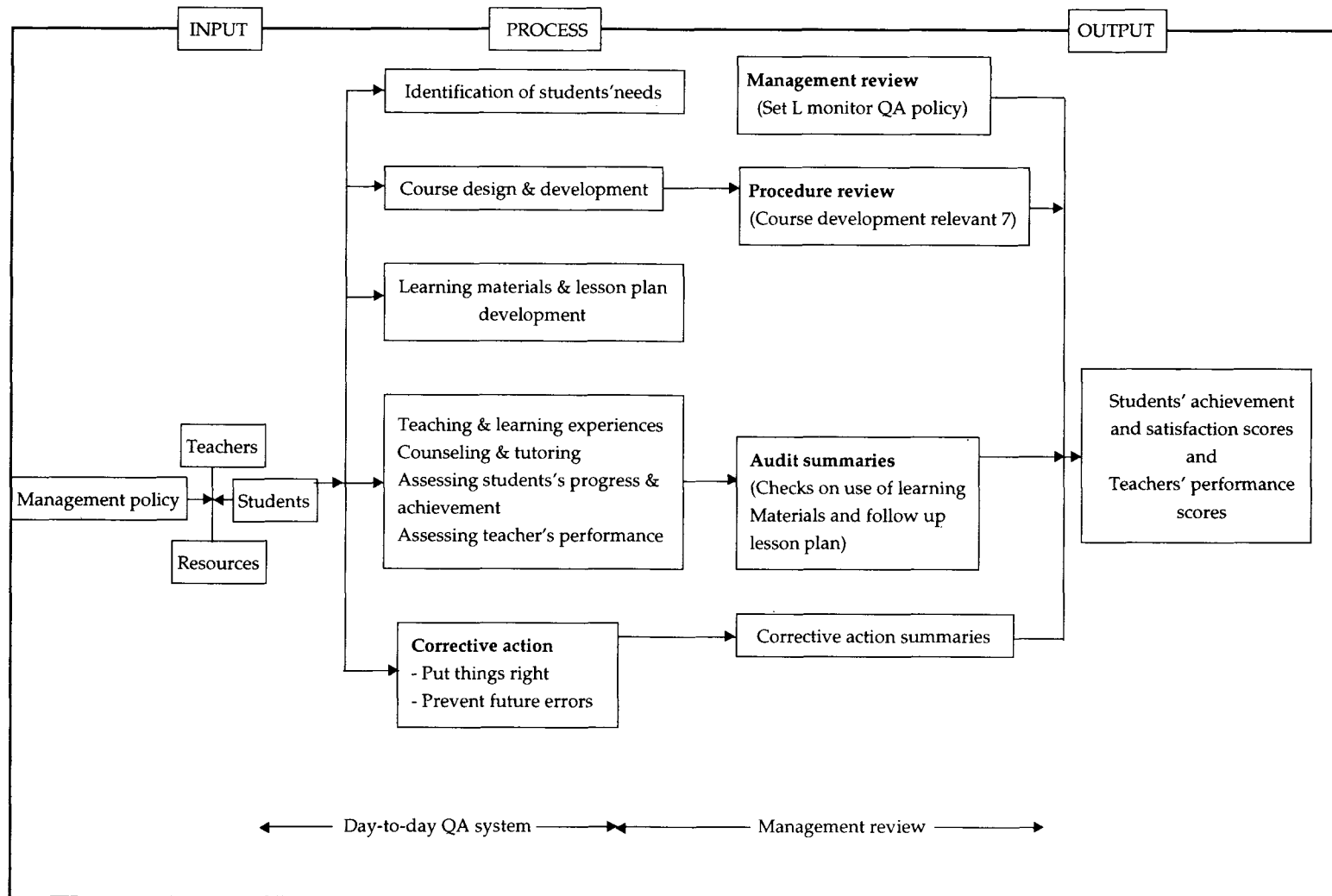


Figure 1. Quality system on teaching/learning ISO 9000

Results

1. Students' pre-and post-tests and final evaluation

The mean scores of pre-and post tests were significantly different in Unit 1, Unit 2, in the students in the B.Sc. Nutrition and Dietetics program; in Unit 2, Unit 4&5 in B.Sc. Environmental science program; and Unit 1 in B.Sc. Occupational Health & Safety program (Table 1).

The comparison of the post-tests among 3 programs were significantly different (Table 2).

The comparison of the students' opinion on students' and teachers' performance, comparing studying ISO 9000 and other courses, showed that only 2 items were significantly different among 3 groups of students (Table 3, item 5, item 24). Eleven items were significantly different between B.Sc. Env.Sci. and B.Sc. Occ.&Safety (Table 3, items 1, 4, 11, 12, 13, 15, 16, 19, 26, 31, and 33). There were 12 items which showed not significant difference among 3 groups of students (Table 3, items 2, 3, 6, 9, 20, 23, 27, 28, 29, 60 and 33) because they were parts of quality process. Other items showed significant difference between 2 programs only, such as items 14, 17, 18, 21 and 25 (Table 3).

The important teachers' and students' performance indicators were as follow:

1. The teacher used interesting teaching techniques.
2. Definite and clear examination criteria are used and the students were informed in advance.
3. The students received the course outline and learning materials within the first day.
4. Session objectives and session outlines were introduced at the beginning of every session of teaching.
5. Topic and subject-matters were taught on time as scheduled in the course plan.
6. When there was a problem, the teacher pointed out the weak point and solution to the students.
7. The teacher evaluated the students' achievement with justice, and without biases.
8. The teacher indicated issues for discussion properly.
9. The teacher encouraged students to express ideas and different view points, or new ideas.

10. The students attended class regularly.
11. The students were satisfied with the learning experience provided.
12. The seminar provided analytical thinking skills to students.
13. The teacher prepared classroom and A-V aids before teaching.
14. The teacher indicated form and length of students' report, properly.
15. The teacher made sure that the students understood what he taught.
16. The teacher concluded subject-matters at the end of every teaching session.
17. The students did not cheat in the examination or copy another's work.
18. When students had a problem with examination results, the teacher allowed students to ask for clarification.

2. Teachers' and students' opinion on quality assurance in the teaching/learning ISO 9000

The research team-leader conducted indepth interviews with three teachers. All expressed satisfaction. Low-compliance occurred because "Course ISO 9000" was implemented on a voluntary basis joined by those who had self-interest in this study. They learned both the subject-matter of ISO 9000 and its application to education for ensuring students' satisfaction and better performance in teaching/learning process, and higher students' achievement scores. The research team-leader was responsible for quality teaching/learning in daily work.

The research team-leader also conducted an in-depth interview with 10 students, all expressed high satisfaction and expected that no one would fail in the study if quality assurance was undertaken, as in this study. The course should be a formal one to prevent time constraint, and a field study should be included.

Table 1. Mean difference between pre-and post-tests of the three B.Sc. Programs

Unit of Session	n	Pre		Post		\bar{d}	\bar{sd}	t	p-value
		\bar{X}	SD	\bar{X}	SD				
B.Sc.Nutr & Diet									
1	10	4.8	1.3	7.3	1.2	-2.5	1.5	-5.24	.001
2	10	3.9	1.0	6.6	1.6	-2.7	1.1	-8.09	<.001
3	10	3.9	2.0	5.5	1.3	-1.6	1.9	-2.67	.026
4,5	10	6.0	0.8	6.9	1.2	-0.6	1.6	-1.78	.108
B.Sc.Env.Sci									
1	19	5.2	1.7	5.2	0.9	1.9	0	0	1.000
2	19	5.8	1.2	7.4	-1.6	2.1	-3.34	-3.34	.004
3,4	19	5.8	1.2	6.8	-0.95	1.8	-2.37	-2.37	.028
B.Sc.Occ.H.									
1	45	6.3	1.2	8.1	1.2	-1.8	-1.5	-7.64	<0.001

Note : Maximum score of learning unit = 10

Table 2. Knowledge - gain after learning, comparison among three B.Sc. programs

Programs	n	\bar{d}	\bar{sd}	F	p-value
Nutr.& Diet	10	+2.5 ^a	1.5	10.50	<.001
Env.Sci.	19	0.0 ^{a,b}	1.9		
Occ.H.	45	+1.8 ^b	1.5		

Table 3. Mean difference between learning course on "ISO" and "others" among 3 B.Sc. programs by performance items. (One-way ANOVA)

	(n=14)		(n=45)		(n=35)		F	p-value
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD		
1. Students receive the course outline and learning materials within first day.	4.4 ^a	0.6	4.6 ^b	0.7	3.4 ^{a,b}	0.7	35.26	<.001
2. Teacher allows students to participate in determining learning activities.	3.6	1.1	3.2	1.0	3.0	1.1	1.99	0.1418
3. Teacher introduces and relates new knowledge to past learning experiences at the introduction of each session.	4.0	0.7	4.0	0.7	3.7	0.7	1.62	0.2027
4. Teacher indicates objectives, learning topics at introduction.	4.4 ^a	0.8	4.7 ^b	0.5	3.4 ^{a,b}	1.0	28.76	<.001
5. Teacher uses interesting teaching techniques.	3.6 ^a	0.6	4.5 ^a	0.5	3.1 ^a	0.8	48.57	<.001
6. Teacher is friendly with students.	4.4	0.8	4.6	0.5	4.3	0.5	1.79	0.1730
7. Teachers allows for questioning while teaching.	4.6 ^a	0.5	4.2	1.0	3.8 ^a	0.9	4.31	0.0164
8. Teacher explains clearly.	4.0 ^b	0.4	4.5 ^{a,b}	0.5	3.7 ^a	0.6	18.60	<.001
9. Teacher listens to students and responds to their requirement properly.	4.0	0.7	3.8	0.6	3.5	0.9	2.49	0.0880
10. Teacher gives feed-back to students' answers immediately	4.4 ^{a,b}	0.6	2.4 ^b	1.0	2.3 ^a	0.8	29.68	<.001
11. Teacher teaches subject-matters as planned and on-time	4.6 ^a	0.6	4.3 ^b	0.6	3.1 ^{a,b}	0.7	43.05	<.001
12. Teacher helps slow-learning students to solve their weak points and problems every time.	3.6 ^a	1.1	3.8 ^b	1.0	2.7 ^{a,b}	0.7	14.86	<.001
13. Teacher evaluates students' learning achievement regularly with justice and without biases	4.6 ^a	0.6	4.5 ^b	0.7	3.8 ^{a,b}	0.8	9.37	0.0002
14. Teacher indicates form and length of students' report properly.	3.6 ^a	1.2	3.3	1.1	2.8 ^a	0.9	4.03	0.0210
15. Teacher indicates issues for discussion properly.	4.1 ^a	0.7	3.6 ^b	1.1	2.7 ^{a,b}	0.8	13.32	<.001
16. Teacher encourages students to express ideas, different view points or new ideas.	4.4 ^a	0.6	4.4 ^b	8	3.3 ^{a,b}	0.9	17.69	<.001

Table 3. (cont.)

	(n=14)		(n=45)		(n=35)		F	p-value
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD		
17. Teacher makes sure that students understand what he/she teaches.	4.1	0.7	4.3 ^a	0.8	3.7 ^a	0.5	8.49	.0004
18. Teacher summarizes important subject-matters every time of teaching.	3.9	1.0	4.4 ^a	0.7	3.7 ^a	0.7	10.57	.0001
19. Students attend class regularly.	4.2 ^a	0.8	4.6 ^b	0.7	3.5 ^{a,b}	1.1	14.74	<.001
20. Students behave under rules and regulations, do not disturb others in-class or in library.	4.1	0.7	4.0	0.8	4.1	0.8	0.13	0.8740
21. Students do not cheat in the examination or copy others' work.	4.6	0.5	4.8 ^a	0.5	4.2 ^a	0.7	9.74	0.0001
22. Students hand in home work in time.	4.4	0.6	4.6	0.7	3.4	0.6	0.53	0.5904
23. Students participate in discussion and study as assigned	4.4	0.8	4.0	1.1	4.0	0.7	1.35	0.2632
24. Examination criteria is definite and students know in advance in written words.	^a 4.4	0.8	3.6 ^b	1.2	^a 2.9	1.1	11.07	<.001
25. When students are not sure about results of examination, they are allowed to ask for details.	4.4 ^a	0.8	3.8	1.2	3.3 ^a	1.2	4.42	0.0147
26. Students are satisfied with the learning experience provided.	4.1 ^a	0.8	4.5 ^b	0.5	3.5 ^{a,b}	0.7	24.20	<.001
27. Students gain knowledge after learning.	4.1	0.7	4.2	0.7	3.9	0.6	2.54	0.0841
28. Students can apply knowledge.	4.0	0.8	3.8	0.9	3.6	0.7	1.78	0.1742
29. Audio-visual aids are relevant	3.9	0.9	3.7	0.6	3.9	0.7	1.57	0.2132
30. Field study provides real life skills to students.	3.2	1.1	3.0	1.3	2.9	1.2	0.42	0.6555
31. Seminar provides analytical thinking skills to students.	4.0 ^a	1.2	3.8 ^b	0.9	3.1 ^{a,b}	0.9	6.48	.0023
32. Teacher prepares classroom and teaching aids before teaching.	4.1 ^a	1.0	3.6 ^b	0.8	3.3 ^{a,b}	0.8	7.27	.0012
33. Examination questions are clear, concise and within the limits of time.	3.6	1.2	3.8	0.7	3.3	0.8	3.40	.0376
Total	4.1 ^a	0.5	4.0 ^b	0.4	3.5 ^{a,b}	0.4	24.7	<.001

Note : Same letter of pair comparison in the horizontal line means statistically significant
 Maximum score of each item = 5.

Discussion, Conclusion, Recommendation

Discussion

Quality education at the classroom level shall not be successfully achieved on a voluntary basis, if more than one teacher is required. The major constraint is time. The success of this study depended on the interested staff who wanted to have self-improvement and to be good teachers. Two important activities : field study and seminar were deleted because of time problems.

Quality education is a process with a long term basis. Preparation of written learning materials, quality manual, instruction procedures, assessment forms and records are time consuming tasks. It needs a large initial effort and needs correction in the following up. It would be easier later on. Students' class attendance rate and satisfaction scores, teachers' performance score, students' performance score, students' achievement scores, course's attractiveness and running cost, are the evaluative indicators for quality and effectiveness of the course.

Ten activities in teaching/learning process were not significantly different (mean score difference between learning ISO 9000 and other courses), comparing among 3 groups of students, as follow:-

1. Students participate in decision making of course activities.
2. Teacher relates what has been learned to what will be learned in every introduction.
3. Teacher is friendly to the students.
4. Teachers listens to students and responds to students. properly.
5. Students behave properly, and are not a nuisance in the classroom or the library.
6. Students hand in the home work on time.
7. Students participate in discussion and study as assigned.
8. Students gain more knowledge.
9. Students can apply knowledge, relevantly.
10. Teaching/learning audio-visual aids are relevant.

These ten items had already been included in the process of teaching/learning, so they are important quality processes in teaching and learning.

Conclusion

Eight persons participated voluntarily in the quality assurance of a new course on ISO 9000. Seventy-four students, 10 in B.Sc. Nutrition & Dietetic program, 19 in B.Sc. Environmental Science program and 45 in B. Sc. Occupational Health & Safety program were included.

The study was divided into 3 phases : preparation phase for the preparation of quality teaching/learning materials on ISO 9000; classroom phase for teaching/ learning activities; and in-depth interview phase with involved teachers and students.

It was found that students were satisfied with the new teaching method. Non-compliance was related to time constraints . Teaching techniques and explicit examination criteria were ranked significantly important by all 3 groups of students. Another 16 items were significantly important among 2 groups of students. These 18 items are performance indicator, as follow:

1. The teacher used interesting teaching techniques.
2. Definite and clear examination criteria are used and the students are informed in advance.
3. Students received the course outline and learning materials within the first day.
4. Session objectives and session outlines were introduced at the beginning of every session of teaching.
5. Topic and subject-matters were taught on time as scheduled in the course plan.
6. When there was a problem, the teacher pointed out the weak point and solution to the students.
7. The teacher evaluated the students' achievement with justice, and without biases.
8. The teacher indicated issues for discussion properly.
9. The teacher encouraged students to express ideas and different view points, or new ideas.
10. The students attended class regularly.
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13. The teacher prepared classroom and A-V aids before teaching.
14. The teacher indicated form and length of students' report, properly.
15. The teacher made sure that the students understood what he taught.
16. The teacher concluded subject-matters at the end of every teaching session.
17. The students did not cheat in the examination or copy another's work.
18. When students had problem with examination results, the teacher allowed students to ask for clarification.

Recommendation

It is recommended that quality teaching/learning should be followed up continuously as a long term process in formal education. The chairman of the department should take management responsibility for course development and instruction. This study illustrates how quality teaching/learning processes at classroom level can assess themselves, based on performance indicators, as self-regulation. Effective and credible self-regulation in quality teaching/learning activities must be underpinned by high standards of teachers' practice and a commitment to continuous improvement within the resources which are available, Self-evaluation requires individuals and groups of individuals to be open and honest about what they are doing and increase their level of professional accountability, through self-review and peer-review processes, and then strive to improve on it.

Appendix

Quality Manual for Teaching/Learning ISO 9000

1) Management responsibility

The research team - leader was responsible for the management of a new quality course, titled ISO 9000, started from reviewing the quality educational system to auditing and management review. The other members of the research team, one expert in education, and three teaching staff, participated in the development and validated the instruments used in the teaching/learning the course. One expert in Material Science Engineering was invited to be the resource person and to give training on ISO 9000 to all involved in this study.

2) **Quality system**, is a process consisted of input, process and output, of both day-to-day and management review of teaching/learning a course on ISO 9000, (Figure 1) to meet the students' needs.

3) **Commitment with students, contract review** At the initial stage of the opening a new course on ISO 9000, teachers and students of each individual program meet and review the course, and adjust outline and content accordingly. Students sign their names to participate in the learning experiences. The research team leader make sure that the students' requirement is adequately defined and documented, and check that the resources to fulfill the contract is available.

4) **Design control** It is essential to concentrate on things which make a difference:

- How student's needs are identified;
- How needs are turned into curriculum or course specifications;
- How students are recruited and counseled;
- How student progress is monitored;
- How student achievement is addressed;
- How staff are selected;
- How staff are developed;
- How courses (rather than individual students) are evaluated.

A bottom-up process involving students and staff deciding (final evaluation) which items are critical and therefore the ones which will be a "performance indicator" for QA policy in teaching/learning at the classroom level.

All prospective students shall discuss and receive written details of the course in which they have expressed interest. These details shall include:

- The prior knowledge and skills assumed for the course;
- The course objectives, learning time, the method of assessment.

The quality review is the management role of the research team- leader to decide:

- Is it sufficiently certain that quality teaching/learning is being implemented?
- Whether the quality teaching/learning needs amendment?
- How frequent does this data need to be collected?

The efficient and economic way is to scan the course-instruction procedure once it has been written in order to identify:

- The course absentee rates;
- Percentage of session instruction performing as planned and completed on time. The auditing process is shown in Figure 2.

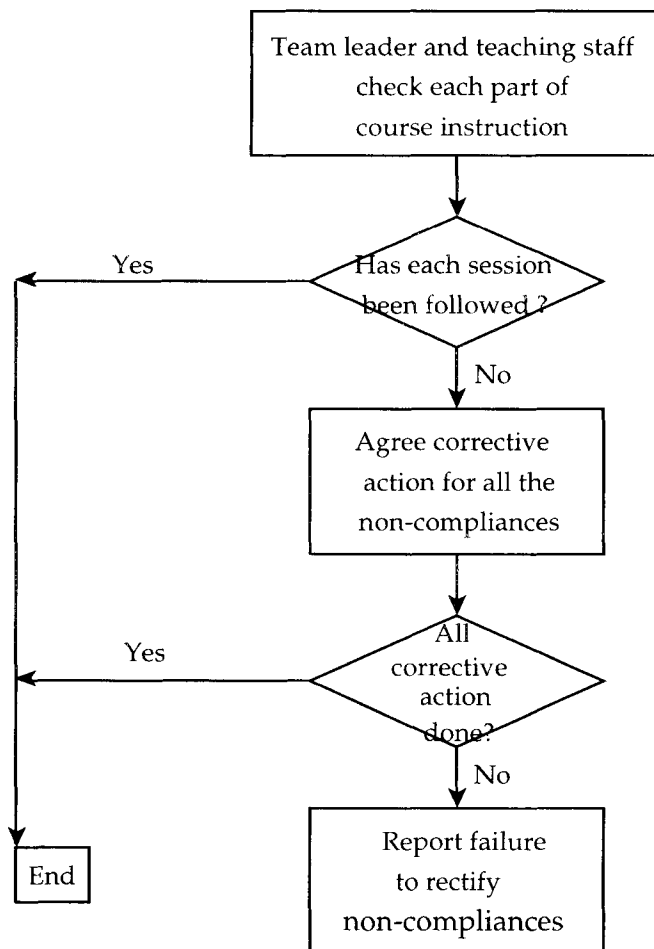


Figure 2. The auditing process

5) Document and data control

A time-table for audit is drawn up for each individual staff member on course instruction on a regular basis, i.e. at mid-course or at the end-of the course. The auditors should be the staff, alternating auditing step by step through each statement in the course instruction, checking the evidence that the step is being done as set out in the course instruction procedure. Any thing which is used to record compliance is called a 'Quality record'. An efficient and 'successful QA system will seek to use everyday working documents as quality records, but the number of documents should not be overloaded, such as:

- Teaching/learning materials, courses description and outline,
- Pre-course data collection
- Completion of performance indicators (final evaluation)

6) Internal audits

At the time of the audit

- Team leader and teaching staff agree in writing the facts of the non-compliance;
- The teaching staff write down what action will be taken to correct the non-compliance;
- The teaching staff agrees by when this will be done (e.g. within next session)

After the audit meeting

- The teaching staff corrects the non-compliance.
- Team leader follows-up the agreed action at the end of the agreed period to see if the action is complete.

7) Corrective and preventive action

There is no guarantee that the corrective action will be taken at the end of the agreed period, so the QA system has to have a means of acting on failure to implement corrective action, e.g. peer pressure of the teaching staff, or the auditor reports the omission to someone higher up in the management chain, e.g. head department or group leader.

8) Management review

Session in and session out, staff will be carrying out tasks and functions according to the agreed QA course-instruction procedures. At regular intervals- perhaps at the end of the course or the beginning of the next course- the whole process becomes an integral part of how teaching/learning is done and managed- this evaluation process is "management review" In a teaching/learning aspect includes:

- Are the objectives met?
- If not, what action should be taken?
- Do objectives, need to be changed?

The "QA management review" follows a similar format:

- The course instruction procedures are being implemented?
- If not, what actions need to be taken?
- Do course-instruction procedures need to be changed?

Routine statistical data that management might seek include:

- Percentage of audits carried out within one target date;
- Number of non-compliances detected per audit;
- Percentages of corrective actions carried out within the time period agreed (i.e. mid-or end-of course) between auditor and auditee;
- What percentage of total non-compliances belong to each course instruction procedures.

9) Statistical techniques

All these data are plotted on time graphs so the trend of performance can be seen easily. Other data might be ad hoc reports, such as teachers' view on how well the QA system supports them in their session instruction. Other statistical techniques include paired t-test, Analysis of Variance, etc., for the comparative study

6. Course instruction procedures

Procedures refer to a process that includes many necessary subtasks. Course instruction procedures includes:

- 1) Enrolment/Recruiting and counseling.
- 2) Course planning.
- 3) Preparation of learning resources and materials.
- 4) Choosing/appointment the staff with right skills.
- 5) Staff development/training.
- 6) Teaching/learning activities (See Table 4) and process (Figure 3).
- 7) Final evaluation.

Table 4 Teaching learning activities, expected results and quality control

Teaching/learning activity	Expected results	Quality control
<ul style="list-style-type: none"> - Before class, teacher checks readiness of classroom and A-V aids. - Students sign names for class attendance, - Teacher distributes handouts, explain methods of teaching/ learning and measurement, pre-test, introduction to the session's topic, explain subject-matter, allowing on-going questions, discussion, conclusion, post test, feedback - Teacher provides counseling, tutoring to special students. 	<ul style="list-style-type: none"> - Students' satisfaction 	<ul style="list-style-type: none"> - Course relevant. and achievement. - Learning materials used. - Instructing on time as planned. - Corrective action against non-compliance.

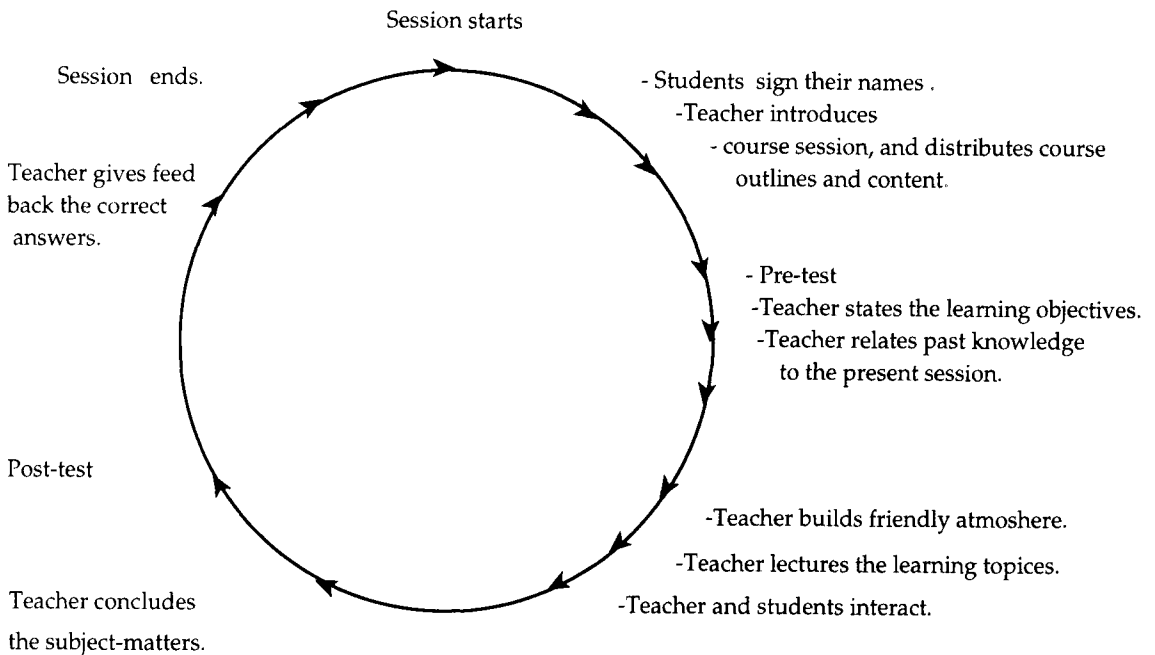


Figure 3. Teaching & learning process.

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