

Lecturing experiences in Urban Drainage: a curriculum in a civil engineering department and the student results

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ABSTRACT: One curriculum in the Civil Engineering Department at the Parahyangan University, Bandung Indonesia, is titled Urban Drainage and equals two credit points for a semester unit. The syllabus of Urban Drainage covers various topics, namely: basic hydrology for urban use, topography and geography of land, land functions and the changing nature of land functions, as well as theories of run-off flow on various coverings of land. Furthermore, run-off analyses are carried out utilising the rational method, using an intensity and infiltration condition, application of the WES method usage soil conservation service or curve number, and an assessment of subsurface drainage using Hooghoudt and Kirkham's method. Since the lecturing process has to comply with the Satuan Acara Perkuliahan (SAP), so, too, do students' activities in the Urban Drainage curriculum. Years of lecturing experience have proven that students' results actually increase at the end of semester when task surveys are given that relate to real estate or housing complexes.

INTRODUCTION

Along with the lecturing process in teaching, which is the learning process based on a lecturer's competence, the lecturing programme unit known as Satuan Acara Perkuliahan (SAP) has been developed. The SAP identifies the duration of activities (in weeks), the core subject, the general instructional objective known as the Tujuan Instruksional Umum (TIU), the specific instructional objective known as the Tujuan Instruksional Khusus (TIK), lecturing materials, as well as primary and secondary textbooks. Lecturing has been carried out using the credit semester system that is based on the meaning of a credit semester unit, known as Satuan Kredit Semester (SKS), which is equivalent to one hour of face-to-face activities, one hour of structured activities, and one hour of private activities. These activities are designed for both the student and the lecturer [1].

The curriculum, focused on in this article, is titled Urban Drainage, which is a two-credit semester unit and equivalent to six hours per week. This curriculum is held in even semesters every year, with 14 to 15 personal activities, a mid-test for two weeks and a final test for two weeks, with the total of week 18 to 19. The lecturing process usually ends with the lecturer evaluating activities by students.

The academic structure of the activities held by the lecturer in lecturing hours, as much as 5 x activities, which consist of 2 x quiz and survey activities that are related with a drainage system in a housing area and or hotel, campus and other buildings.

The article covers a comparison of two student groups' results within the academic structure: one group was given a survey assignment, while the other had no such survey assignment. The comparison was taken from students' results from 1997 to 2002 at Parahyangan University, Bandung, Indonesia.

Essence and Facts

SAP, as mentioned previously, is a guide for the lecturing process that contains an activities' duration (in weeks), the core subject, general instructional objectives and specific instructional objectives, lecturing materials, plus primary and secondary books [1-3].

The credit semester system is carried out based on the meaning of the credit semester unit equivalent with one hour of face-to-face activities in front of the class, one hour of structured activities designed by the lecturer, and one hour of private activities to search out materials [1-3]. The Urban Drainage curriculum is a two-credit semester unit or equivalent with six-hours per week, both for the lecturer and students.

The core subject includes core activities (chapter) that has been lectured over planned weeks, and is the part that students need to know most of all. There are sub-chapters that consist of materials as detailed in the syllabus [1-3].

The TIU consists of a general competence that has been identified by the lecturer and is affected by the lecturer's professional judgement. The TIU also includes expectations that students will distinguish the subject matter that has been planned by the lecturer. An example of this is given below:

After finishing the curriculum, the students can distinguish the environmental drainage; in the cognitive aspect the students can clarify the surface flows; in the psychomotoric aspect the students can distinguish theories or programmes to analyse flows on the surface or inside the channel; in the affective aspect the students can give the opinion whether the drainage in the area comply with the environmental drainage criteria, and need further adjustment [2].

The TIK consists of the learning target that classifies what student behaviour should be achieved after following the curriculum with the specific competence. It is a further clarification from the general competence in the TIU. The TIK is formulated in writing and the result is observable and measurable (with a test), and states the intention to set up a test. Therefore, the TIK has to contain substances that can give guidance to develop a test that can measure expected student behaviour, which are known as audience (A), behaviour (B), conditions (C) and degree (D).

A simple formulation of the TIK contains a specific competence, as identified below:

After finishing the curriculum, the students can plan and design environmental drainage; in the cognitive aspect the students can analyse the surface flows; in the psychomotoric aspects the students can use the theories or programmes to analyse flows on the surface and inside the tunnel; in the affective aspects the students can evaluate that the drainage design in the area comply with the environmental drainage criteria, and need further adjustment using the theories that they have learned [2].

The material provides a detailed explanation of the core subject that has been developed and is consistent with every TIK. It can be combined with other subjects from the TIK to become one core subject. Relevant primary and/or secondary books relate to the subject that will be discussed in the planned week and give other information, such as theories and subject's information as it relates to the core subject [1-3].

The means of environmental drainage facilitates run off by discharging the flow through a water precipitation channel (drainage) and filling/storing up a quantity of the volume to a pond. This will permit a larger drainage flow to a lower area so that it does not cause a flood [4].

Most education and/or teaching activities will indicate the targets or goals, such as cognitive, affective and certain kinds of psychomotoric aspects. Every subject in the TIU and TIK is like this [2][3].

Lecturing Process

In the first week, students are informed about the syllabus, SAP, TIU, TIK, lecturing material, primary and secondary textbooks, class attendance requirements, presence required as a percentage for the following activities, such as the mid- and final tests, and the final score (as a number) and final grade (as A, B, C, D or E).

The number of meetings in the current semester, before the mid- and final examinations, is also communicated to students, as are activities that relate to student behaviour, such as no smoking in the classroom and not wearing sandals in the classroom, because a fresh and comfortable classroom is a necessary component of this education. The minimum attendance percentages are in the range of 75-80% and the lecture also gives details about the number of structured activities, various tasks and quizzes, the University's percentage scoring system, and the allocation of marks: 20% for task scoring; 30% for mid-test scoring; and 50% for the final test scoring [5].

Survey Activities

A survey is also carried out based on materials presented a week before and covers design terms for drainage and urban drainage, topography and land use, the amount and type of houses in a housing area, as well as the land closing effect [4][6-9].

A study is carried out on a housing area in Bandung, Indonesia, such as Gedung Sate, the Gubernur Jawa Barat office area, the Parahyangan River Valley, the Setrasari complex, Istana Regency I, the Griya Mas complex, Istana Dago housing, Alamanda real estate housing, Sukup Baru housing, the Kalijati complex, the Batununggal housing complex, Mitra Dago Parahyangan housing, Graha Puspa housing, the Cipaganti plan, Puteraco Gading regency, etc. A precipitation data analysis is required for a specific period (1986-1995) along with the Bandung rainfall intensity with a duration of 5, 10, 30, 45, 60, 90 or 120 minutes for the specified return period of 5, 10 and 20 years. The usage of the return period depends upon the area [4][9].

Task challenges, such as in the housing location survey, include:

- Information gathering about the study location:
 - Topography and land use;
 - Number of certain types of houses;
 - Land with certain closing, park and parking lots;
 - Rainfall and its intensity;
 - Channel dimensions.
- Data analysis to determine the planned flows.
- Time concentration selection.
- Evaluation of channel drainage dimensions.
- The establishment of conclusions and recommendations.
- Setting up of the report as a group paper [4][6-9].

Using the rational method, students analyse flows on the house surfaces, open land, parks and parking lots. Utilising a combination run-off coefficients and the span of housing area for the span of the study area, the discharge flow dimension is obtained. This discharge flow calculation is then used to design the water channel size and this is compared with actual observations; the outcome is usually the same. Differences are found with regard to the channel's depth, but that is usually caused by the free board difference (note: this is made with the same base channel width) [4][6-9].

Analysis is carried out utilising the manual technique of a calculator, because this is used in the mid- and final tests. One weakness is that there is not sufficient information regarding the soil type in open land and land closing with other materials. As such, the approach data from the fit terms were used.

RESULTS

Based on the final task without the survey and survey paper report, the graduation percentage in each class is shown in Tables 1-4 [10].

Based on four years of observations, and although the students involved have different backgrounds, it appears that the effect from the survey generated an increase in percentage scores, as indicated in Tables 5-8 [10].

Table 1: Graduation percentage without the survey task in 1997/1998.

Class	No. of Students	Percentage Grade				
		A	B	C	D	E
C	59	0.00	27.12	62.17	3.39	6.78
D	55	0.00	9.09	70.19	14.55	5.45

Table 2: Graduation percentage without the survey task in 2000/2001.

Class	No. of Students	Percentage Grade				
		A	B	C	D	E
C	56	0.00	14.00	52.00	23.00	11.00
D	59	0.00	10.00	47.00	22.00	8.00

Table 3: Graduation percentage with the survey task in 2001/2002.

Class	No. of Students	Percentage Grade				
		A	B	C	D	E
A	49	4.00	37.12	29.00	22.00	8.00

Table 4: Graduation percentage with the survey task in 2002/2003.

Class	No. of Students	Percentage Grade				
		A	B	C	D	E
A	47	13.00	47.00	34.00	4.00	2.00
B	34	26.00	47.00	24.00	3.00	0.00

Table 5: Classification of graduation percentage without the survey task by grade in 1997/1998.

Class	Grade	No. of Students	Percentage
C	A	0	0.00
	B	16	27.12
	C	37	62.71
	D	2	3.39
	E	4	4.67
	Sum	59	
D	A	0	0.00
	B	5	9.09
	C	39	70.19
	D	8	14.55
	E	3	5.45
	Sum	55	

DISCUSSION

It can be seen from the tables that students' results have improved when a task survey was incorporated in their lecturing activities.

By utilising survey methods, there is an expectation that students will become more familiar with real cases in the field that are based on theories in order to analyse drainage. This can range from preparing materials and gathering the relevant data to be analysed with the relevant theories. So, it helps to generate expertise for entry into the workforce, and students become acquainted with programmes that help them accomplish environmental drainage problems.

Table 6: Classification of graduation percentage without the survey task by grade in 2000/2001.

Class	Grade	No. of Students	Percentage
C	A	0	0.00
	B	8	14.00
	C	29	52.00
	D	13	23.00
	E	6	11.00
Sum	56		
D	A	0	0.00
	B	6	9.09
	C	28	70.91
	D	13	22.00
	E	12	20.00
Sum	59		

Table 7: Classification of graduation percentage with the survey task by grade in 2001/2002.

Class	Grade	No. of Students	Percentage
A	A	2	4.00
	B	18	37.12
	C	14	29.00
	D	11	22.00
	E	4	8.00
Sum	49		

Table 8: Classification of graduation percentage with the survey task by grade in 2002/2003.

Class	Grade	No. of Students	Percentage
A	A	6	13.00
	B	22	47.00
	C	16	34.00
	D	2	4.00
	E	1	2.00
	Sum	47	
B	A	9	26.00
	B	16	47.00
	C	8	24.00
	D	1	3.00
	E	0	0.00
	Sum	34	

In order to understand more about urban drainage science, which is an applied science, other sciences must also be studied, such as:

- Engineering hydrology to analyse the discharge design within a certain return period;
- Hydraulics engineering and its relation with channel dimentioneering;
- Geodetic engineering to provide the material in order to develop a description about topography elevation from the channel trace planned, and in land clearing and grading, as well as cut and fill work;
- Soil mechanics to reveal a description of the soil properties about permeability and hydraulics conductivity as it relates to the infiltration analysis [4].

CONCLUSIONS

Some conclusions have been made from the urban drainage curriculum in the Civil Engineering Department, as well as related thoughts that have originated from the teaching-learning process. These include:

- Based on the study results in 1997/1998 and 1998/1999, where there were four classes without the task survey, the results did not show any A grades, although 10.92% of students received an E grade. In contrast, in the 2000/2001, 2001/2002 and 2002/2003 periods, where there were five classes with the task survey, A grade results represented 13.08%, while E grades decreased to only 3.84%.
- Students can better accept lecturing material if they face real problems in the field and can relate their studies to a field case.
- In learning an applied science, it has been found that it is also necessary to understand other sciences that relate to the core material learned.

RECOMMENDATIONS

Throughout the study on the Urban Drainage curriculum, information that was related to technical advanced education was clarified and elucidated by the core subject, TIU and TIK; this helped to define what was expected of students, as well as lecturer competence. This was revealed in material explanations and clear references. Every explanation involved efforts to improve the cognitive aspect, behavioural aspect, as well as psychomotoric aspects in some related science. It was also related to an ingenious aspect in order to accomplish the idea.

At the initial meeting, it was considered important to stress the academic and non-academic aspects, and conditions that students were expected to conform to. There are three aspects that are considered important.

Firstly, terms to be followed by students in the lecturing process include:

- Punctual attendance as per the planned schedule.
- Along with the terms of the University/Faculty/Department, a student's attendance cannot be less than 75% from the lecturer's presence.
- Students are required to read books or handouts before the next lecture.
- Students are required to obey particular rules, such as not smoking in the classroom and no wearing of sandals.
- Performance of tasks set by the lecturer.

Secondly, identification of what can and cannot be during the lecturing process and tests, such as:

- Students cannot cooperate when doing tests.
- Students should be active in asking questions of the lecturer, and answer those given by the lecturer.
- Students should discuss lecture materials in groups.
- Students should locate and read lecture materials from other references.
- Students should reveal their thoughts during lectures, even when different to the lecturer's explanation.

Thirdly, identification of the rights and obligations of students and lecturers, such as:

- The lecturer:
 - Display disciplined time management and presence as planned.
 - Announce any lecturing absence and substitute some other time based on collective agreement.
 - Show fairness to all students, without reference to ethnic group, religion, race or social status.
 - Appreciate that students are the nation's next generation.
 - Ask questions positively of students, even if the question is simple and has already been explained.
 - Give illustrations in order to eliminate problems.
- The student:
 - Give opinions about the lecture materials as explained in lectures if they have different thoughts.
 - Have the right to ask the lecturer about assessment, such as the mid- and final tests, or other test and exercises.
 - Have the same opportunity to ask questions outside the classroom or in the lecturerroom.
 - Have equal chances for assistance and guidance.
 - Come to class and listen to the lecture process every week as planned and explain any absence.
 - Answer the lecturer's questions associated with certain material that are considered to be important.
 - Complete tasks and exercises set by the lecturer, including private study.

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