

Learning opportunities for product designers and engineers

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ABSTRACT: In the article, the author reviews the successes and limitations of a programme for designers and engineers to further their education. In order to accommodate the diverse backgrounds and needs of these part-time students, the author offers suggestions in the article on student-centred arrangements in terms of programme objectives, learning activities, the learning environment and channels of communication between students and teaching and administrative staff. Effectively, student-centred education relates to three levels of work, namely: understanding students' backgrounds; respecting what students need; and focusing on students' needs. Such a student-centred focus also entails more flexible timetable arrangements in the learning environment, as well as establishing *regular* and *informal* channels of communication.

INTRODUCTION

A part-time programme has been offered to design and engineering graduates to give them the opportunity to continue their learning. In this article, the author reviews the limitations of the programme and proposes possible improvements, noting that, nowadays, part-time students in a programme are always from different backgrounds and have different experiences. They have different learning needs, preferences and expectations. Moreover, due to the heavy workload and common need to work outside the city or town in which they reside, part-time students presently find it difficult to find the time to attend classes, particularly if the learning arrangement is rigid.

As with many current part-time programmes, the programme has more flexible requirements for enrolment and a wider scope in order to benefit and attract more students. However, this makes coordinating the programme and subjects relatively more difficult than before. Based on observations of the classes and interviews with the students, the author discusses how the programme should be further strengthened and improved, ie how to offer student-centred subject contents and learning activities; flexible timetable arrangements and a flexible learning environment; and channels of communication among students, programming coordinators and teaching staff (including project supervisors).

FURTHER/CONTINUING EDUCATION PROGRAMME

A degree programme was co-established in 2000 by a design school and two engineering departments in a university in Hong Kong. The programme is offered in a part-time mode and is targeted at designers and engineers who work in design-related industries and who wish to further their education and extend their experience at a university. Most students accepted into the programme are those who have not obtained a degree qualification in the areas of product design and engineering.

So as to meet new economic and industrial needs, and also to give Hong Kong designers and engineers an edge over those on the Chinese mainland, one of the core aims of the programme is to nurture them to be more creative and innovative. In addition to subjects that provide conventional mathematical, technological and engineering knowledge and experience, design subjects are offered in the programme in order to provide to students with innovation-oriented knowledge and experience.

As the programme was being run, evaluations of the programme and the design subjects were conducted. Besides questionnaires and formal end-of-term meetings between staff and students to obtain the students' general feedback on the overall arrangement of the programme, in-class observations and interviews with the students in some design subjects have been conducted since 2000. Interviewed students were randomly selected from class and invited to comment on the arrangement of the programme and the subjects, and voice their opinions about their studies, including any difficulties encountered. Given these observations and interview results on some of the design subjects carried out in 2000, 2002 and 2004, there are some areas worth considering to help and encourage students to continue their learning.

Student-Centred Subject Contents and Learning Activities

The expectation is that the programme will enrich the knowledge and experience of students with different backgrounds and expectations to benefit them in their current jobs and future development. Starting from the beginning, subject coordinators kept in mind that the contents of a subject should be set in a *more flexible way*. This means that only a syllabus framework for each design subject is set in the documents of the programme. The syllabi intentionally give lecturers and project supervisors the space to revise contents and arrange learning activities.

After four years of running the programme and setting up detailed subject contents and activities each year, it was found that the phrase *in a more flexible way* implied the spirit of *student-centred*. This means, firstly, that subject coordinators, lecturers and project supervisors should have an awareness of the social and industrial needs that students need to address now and in the future. Only with such awareness can subject coordinators, lecturers and project supervisors prepare subject contents and activities to guide and *motivate* students to learn, and allow what is learnt to benefit students.

Secondly, student-centred denotes three levels of work, namely: understanding the backgrounds of students; respecting what they need; and focusing on what they need (see Figure 1). For example, in 2004, students in the class of a design subject in the programme came mainly from electronic and multimedia engineering fields. Then, after reviewing the backgrounds of students and holding discussions with them, the project for the subject required students to focus on a human-interface design. In fact, in 2002, most students coming from manufacturing engineering studied the same subject. In this way, the subject contents and project were then arranged to be more related to product analysis and design.

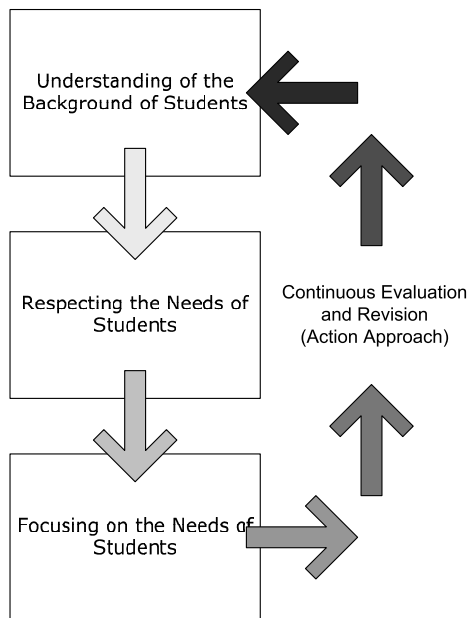


Figure 1: The three levels of programme and subject development in the student-centred approach.

Thirdly, student-centred does not only imply caring about the majority of students. It was observed that the approach of changing detailed subject contents and activities to suit most students was not good enough. In fact, students in a class are always diverse and some have special needs; they should not be seen as being the same. Thus, instead of expecting subject coordinators or lecturers to fix activities for particular groups of students, as the interviewed students indicated, the best way to pursue a student-centred approach in the subject contents and learning activities is to permit students to have more freedom to make their own adjustments and decisions [1]. That is to say, students should participate, to a certain degree, in the process of making decisions about their studies' contents and activities.

That is, students should have the chance to voice their opinions and raise their concerns at some meetings with programme and subject coordinators. Students can review what they have

learned in some previous subjects in the same programme and hold discussions with coordinators about the aims and requirements of new subjects. For example, in a meeting with programme and subject coordinators, some students stated that they felt mathematics to be difficult. The coordinators then arranged a remedial class and revised another subject in the coming term to allow students to refresh their knowledge. Another example involves students affirming that they were assigned too many group projects and people tended to stick with the same group in different projects. This feedback gave project supervisors of new subjects the idea to rearrange subject contents, project objectives and requirements, and activities.

Another way to engage in a student-centred approach is to give students a high degree of freedom in initiating things [2]. For example, different from the conventional practice being provided project titles or a set of titles by project supervisors, students are increasingly required (or should have more opportunities) to identify their needs and titles by themselves according to their particular learning attainments and expectations [3][4]. They are also encouraged to propose ways of working. For example, under such a student-centred arrangement, a student with a systems engineering background identified a problem with the current underground transportation system and tried to redesign the system to solve the problem of congestion, specifically keeping in mind the densely populated nature of the city. His approach was to conduct a literature review and interviews with people working for the underground transportation company, and then generate a new conceptual transportation system. In another class, a group of students with a background in multimedia design identified the needs of tourists and then generated a new concept for a multi-language interface system for information booths. Their approach was to carry out site observations and then make a prototype (graphical illustrations of the interface system) of a selected booth. In the same class, several students with a background in fine arts considered public art in the urban environment and decided to redesign the furniture available in open spaces. They also conducted observations, but more preferred to produce models by hand to test the form of their designs.

In interviews and casual conversations held in the class, most students agreed that the arrangement of the above student-centred subject contents was good. Many of them also agreed that the fact that lecturers and project supervisors frequently listened to their opinions resulted in students obtaining knowledge and experience that was useful in their current jobs, and better prepared them to face the changing needs of industry. Students also remarked that the arrangement of learning activities was good and that it was flexible enough for them to obtain knowledge and experience in areas in which they were interested.

On the other hand, students also commented that such student-centred arrangements made them feel confused at the beginning of a course. In particular, nearly all freshmen students had no experience in self-initiated studying. This was because most of their previous learning experiences were quite conventional. They only needed to follow instructions to meet the assigned requirements and attend examinations. They found making decisions on their directions/areas of learning to be quite difficult. In fact, in 2000 and 2002, in the same design subject, during the first few weeks, instead of treasuring the freedom to select their project titles, some students asked the project supervisors to fix a title for them.

In addition, a student-centred approach does not mean that there is no work for lecturers and project supervisors. Instead, as pointed out by lecturers and project supervisors, because of the different natures and directions of the projects, their workload became heavier. According to students' particular and diverse learning goals and needs, lecturers and project supervisors needed to provide students with different theoretical support and guidance. This is also one of the drawbacks of student-centred arrangements. Although lecturers and project supervisors could gain a brief understanding of the backgrounds of the students before a subject began, they had relatively less time to prepare materials because they would not know the actual needs of students until they met them in class.

Flexible Timetable Arrangements and the Learning Environment

It is essential to understand how timetables and learning environments can affect the contents of student-centred subjects and learning activities [5][6]. In a student-centred approach, the learning of students relies heavily on them being able to initiate decisions; thus, the variety and nature of the learning activities become more complicated. For example, the project was the core learning activity as well as the main object of assessment for the design subjects in the programme. In order to understand the real needs and preferences of Hong Kong people and identify project titles, students had to spend a large amount of time conducting field investigations and communicating with their target groups. Since the project supervisors did not fix the project titles, students needed to conduct different kinds of investigative activities according to their particular learning attainments. Because of these project requirements and the characteristics of the project activities, it was relatively more difficult for students to attend class than before. For example, students had to conduct interviews, which was mostly during office hours. The time for making observations was also not always only after class. Moreover, the contact time between the supervisors and students had to be adjusted.

Further, the programme is a part-time programme for students who have jobs. As many students, especially those working in engineering companies, needed to work on the Chinese mainland, work in shifts and attend meetings abroad, it was not easy for them to follow a rigid timetable to attend class.

Given all of these considerations and constraints, since 2000, there have been some flexible arrangements in some design subjects on the timetable and location of places of learning (for details on the arrangements for flexible timetables and learning environments, see Refs [5][6]). For example, apart from attending lectures that introduced the subject and presented the core theory and making a final project presentation, students were free to make changes to parts of their timetables following mutual agreement between themselves and the lecturers (and project supervisors). For example, whereas in the past, lessons for part-time students were only conducted in the evening, students now had the freedom to meet their lecturers and project supervisors during the day (such as in group tutorials), or to carry out their investigations or project work with their fellow group members in the evening. In addition, the environment for teaching and learning did not narrowly imply *university* [5][7]. Places for investigation (such as sites for observation) became a kind of *classroom* outside the university. In fact, the lecturers and supervisors sometimes had to meet their students, give informal lectures and conduct

discussions on sites. Interviewed students confirmed that this kind of flexibility was not possible in the past, as they had to attend classes in accordance with a fixed university timetable and at fixed physical locations. This generally caused students to plan and select their learning activities to fit in with the university's timetable, rather than to fulfil their real needs and interests.

Overall, according to observations and feedback from teaching staff and students, the flexible timetable arrangement and learning environment was satisfactory. However, as the reviews conducted in 2002 and 2004 have shown, such *flexibility* has its drawbacks, particularly from the administrative point of view. It is easy to notice that the timetable arrangement can become complicated. Moreover, coordination with other subjects and the increased workload for teaching staff, support staff and administrative staff presented problems that imposed constraints on flexible arrangements.

In addition, according to feedback from some students given in the subject evaluations of several design subjects, the greater flexibility they had for arranging how they spent their available time on different activities required them to be highly self-motivated. Both students and teaching staff noted that students with low self-motivation increased the workload of other students and teaching staff. This situation was much worse when greater cooperation among students was required to complete the project. For instance, some students complained that it was difficult for them to arrange times to meet other members of their project group outside the university, while some had little commitment to the group project.

Channels of Communication

As discussed above, allowing students to voice their concerns and opinions is very important in providing a suitable programme for students to further their studies. According to feedback from coordinators of the programme, it was discovered that establishing *regular* and *informal* channels of communication among students, coordinators and teaching staff not only helped to make the programme fit the actual needs of students, but it also eliminated (or at least minimised) the dissatisfaction felt by students. In fact, in casual conversations after class, students stated that they would not feel so unhappy, nor make complaints, if they thought that their opinions were being respected and considered.

Moreover, students agreed that most of the time they focused on instant benefits from learning, not on the future goals and needs of their careers. This explains why, in the example discussed above, some students did not take advantage of the freedom to identify their project title and instead asked the project supervisors to accord a fixed title. If the programme coordinators and teaching staff could clearly explain to students and give them the guidance in (re)considering their situation and looking at the new arrangements and requirements of the programme and subjects carefully, then students might come to think differently. Obviously, students further pointed out that whether they changed their perceptions and agreed to the new arrangements and requirements depended on whether the programme coordinators and teaching staff really had a good understanding of current and future educational and industrial needs.

According to the evaluation of a design subject in 2004, some students also affirmed that it was not a bad idea for

coordinators and teaching staff to present their difficulties and constraints to students. For example, many students complained that the length of the programme for part-time study was too long. Students with a design background always complained that engineering subjects were too difficult for them. They also always made comparisons with other programmes that were shorter in length. After coordinators pointed out that the credit-based learning policy in Hong Kong tertiary education and the requirements for accreditation by engineering professional bodies were beyond the control of the university, students redirected their energy from complaints to working in a more positive manner.

CONCLUSIONS

It is inarguable that continuing education is more and more important nowadays, as society changes much more rapidly than before [8-11]. However, the question is how to approach continuing education. As can be seen from the above discussion, one of the major difficulties faced by universities nowadays in offering programmes, especially part-time programmes, for continuing education is the diversity in the backgrounds and experiences of students [12]. Students also have different needs and expectations of programmes [10][14]. According to the case of a part-time programme offered to students in product design and engineering discussed above, it is maintained that, in order to promote a more student-fit product design and engineering programme in terms of meeting the current and future needs of students and industry, subject contents and learning activities should be more student-centred. It is obvious that, although many lecturers and project supervisors have extensive experience to give comments and recommendations to students, students are still the first persons to know what it is they exactly want. Further, providing opportunities for students to initiate and make decisions about their areas and ways of learning is the most effective method to motivate students to learn [3].

Moreover, part-time students face quite a lot of constraints in going back to university to further their education. For example, because of the inflexible arrangements, students easily give up on their learning, resulting in a high dropout rate. Thus, programme and subject coordinators and teaching staff are necessary to *facilitate* a flexible learning environment in terms of devising a timetable and physical environment to help and attract students to learn. Experience in running the programme for four years indicates that the most important point is that there is a flexible learning environment (ie a student-favourable learning environment) that can help students *continue* their studies.

Finally, establishing channels of communication among students, programming coordinators and teaching staff is important for the operation and improvement of the programme. Currently, part-time programmes often face two major types of students who have problems and are dissatisfied. Some are not willing to give opinions and want to escape from all difficulties. Another type is those who are always making complaints and like to use their previous learning experience and working experience, as well as the argument of their rights as a client to put pressure on universities. Experience suggests easing tensions from these two types of students can be achieved by mutual respect,

opportunities for communication, and swift and explicit responses to requests. Additionally, society and the nature of industry and the economy are changing quickly and continuously. Only through increased communication can a programme be modified on time and offer a good vision and plan for the future.

AUTHOR'S NOTES

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