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Engineering flexible teaching and learning in engineering education.

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Abstract
The key challenges for achieving flexibility in flexible mode programs in engineering and technology include: the integration of the explicit and implicit content in potentially disparate and isolated study modules across the whole program curriculum; ensuring the validity and consistency of policies for granting students advanced standing based on recognition for prior learning and workplace experience; developing learning materials and experiences that cater for a wide and diverse audience, while at the same time offering relevance to the individual student in their own context; creating innovative communication environments that bring remote students into both the directed and the discursive discussion that are an important part of the learning process; and the financial and resourcing sustainability of the development, maintenance and delivery of high quality flexible mode engineering and technology study programs.
1. Introduction

Flexible delivery of engineering and technology education is now an essential component of the engineering education scene, catering for significant numbers of students who cannot attend traditional, full-time, on-campus studies. While flexible delivery of teaching and learning provides many benefits to both students and academic staff, systems of flexible delivery can also introduce many inflexibilities that are not part of traditional on-campus classroom teaching, and may not be immediately obvious to those not involved in flexible delivery. Based on a model of flexible delivery of teaching and learning, this paper examines the experiences of the author as an academic operating in an environment of flexible delivery of engineering and technology education, and identifies key challenges for flexibility in flexible mode programs in any educational discipline.

2. Flexible teaching and learning

The term ‘flexible’, when applied to teaching and learning has no single, agreed meaning. Attempts to define the term flexible by reference to related terms like open learning and distance education are fraught with difficulty, as these labels also mean many things to many people. Telford (1995: 165) describes flexible learning as:

...another cover-all term [similar to open learning], inclusive of all forms of learning which, though institution-based, do not follow a laid-down pattern but are adaptable (in terms of time, place, method, etc.) to individuals or particular groups.

Thomas (1995: 2) suggests flexible learning is not necessarily synonymous with open learning:
Flexible learning is not about producing variously deliverable learning packages or pick-‘n’-mix courses to an otherwise undifferentiated mass market. It is about being prepared to configure all available resources, expertise and learning opportunities in the way that fits the learning purpose best.

For the purposes of the following discussion, the approach to flexible teaching and learning is as follows:

Flexible teaching and learning...refers to an approach to education design and conduct based on the conviction that education is a recurrent, lifelong process, centred in the learner and the learner’s ability to make choices about the way learning occurs. ...Foundation principles include...identifying and catering for diverse characteristics of individual learners and groups; accommodating the particular circumstances of learners and teachers and the diverse environmental conditions for learning...and...promoting the appropriate use of technologies to facilitate communicating, learning and teaching. Flexibility is recognised in the level of access to courses; the points of entry to, and exit from courses; the place, time and pace of study; the form and pattern of interactions among learners, teachers and resources; [and] the type and variety of resources to support study and communication... (Deakin Centre for Academic Development 1997: 11).

There is, of course, no reason why conventional-entry university students cannot take advantage of flexible teaching and learning, but the whole idea of flexible delivery arose from the need to cater for students from other than conventional backgrounds. The diversity of students who undertake flexible learning makes it impossible to describe the ‘typical’
flexible student. Students may study on-campus, off-campus or a mix of both modes. Students may study full-time or part-time. Students may study locally or at a distance, or even be based overseas. Students may come directly from secondary school or be mature-age on entry. In addition to their studies, students may have full-time or part-time employment. Students may be supported financially and/or time-wise by their employer, or may be self-sufficient. Students may have previously completed, partially completed or never undertaken post-secondary studies.

3. Flexible teaching and learning in engineering and technology education

A key driver in the development of engineering and technology programs that incorporate flexible delivery is the culture of life-long learning that has arisen from the need to re-equip people with new skills resulting from organisational and technological change (Goldstein 1997, Marchio et al. 1997, Evetts 1998, Keeling et al. 1998). It is unrealistic to expect organisations to release staff to attend full-time, on-campus study; engineering and technology programs need to cater for mature-age students in the workplace who are upgrading their qualifications and skills. Many engineering and technology organisations worldwide are currently establishing links with higher education institutions to provide their staff with customised, flexible programs (Paquet 1995, Haynes et al. 1997, Seaman 1997).

As public funding for higher education worldwide is reduced, universities will find themselves in competition with private education providers. The ‘global village’ created by the Internet means universities can offer flexible study programs based on the Internet and the World Wide Web (‘the Web’) to students anywhere in the world, 24 hours a day. To
survive, engineering schools and the programs they offer will have to become more flexible, innovative and competitive.

For the purposes of this paper, a ‘flexible learning’ program, as defined by Briggs (1995), is one that incorporates:

- a modular curriculum;
- policies for recognition of both formal and experiential prior learning (RPL);
- learning resources and tools, including computer-based resources, to support the learning needs and styles of all students; and
- means of facilitating two-way communication, especially through the use of computer-mediated communication (CMC) in addition to telephone-mediated and face-to-face communication.

With the introduction of engineering and technology degrees based on flexible delivery, there are a growing number of mature age students returning to study to upgrade their qualifications (Klus 1995, Kulandaisswamy and Mandke 1995, Lloyd et al. 1996). The majority of these students have previously studied and/or worked in the engineering workforce. This development poses some issues for the developers of engineering programs.

4. The Deakin engineering program

In Australia the standard entry into professional engineering practice is via the completion of a four year Bachelor of Engineering (BE) undergraduate course. The Deakin School of Engineering and Technology offers three year Bachelor of Technology (BTech), four year
BE, Masters and Doctoral engineering programs in flexible delivery mode. The undergraduate programs are delivered on-campus, full-time for conventional entry students. Mature age students may study the programs off-campus and/or part-time. The programs are designed to articulate tightly with a range of national and international vocational, technical and diploma level engineering study programs. A formalised system of granting advanced standing into the course based on RPL and workplace experience has been developed that permits block credit of up two thirds of a Bachelor of Technology degree and up to half of a Bachelor of Engineering degree (Lloyd et al. 1996).

The entire undergraduate study program has been developed to address the requirements of a ‘flexible learning program’ as identified above. It incorporates:

- a modular curriculum;
- a formal assessment system for RPL based on granting advanced standing in appropriate course units;
- course units developed in print form, supplemented by an array of learning resources, including audio and video presentations, home experimental kits, computer-aided learning packages, remote (Internet-based) laboratory experiments and conventional laboratory work requirements; and
- computer-mediated communication systems, including e-mail, video conferencing, Web-based bulletin boards and Internet-based conferencing systems.

While the Deakin Engineering programs are labelled as ‘flexible’, the flexibility is principally in the place of study; because the course units are all available in off-campus mode, students can study at the place of their choosing, including interstate and
internationally. The typical course program contains a small number of ‘elective’ units (up to 4 out of 32 units in a four year Bachelor of Engineering), but the balance of the course is prescribed. The content of each unit is prescribed; there may be some opportunity for students to select the topics of research-related assignments, but the learning objectives of each unit are fixed. While students exercise some control over the sequence of their studies, they must choose within the framework of prerequisite requirements. Students, both on- and off-campus, must generally conform to a semester timetable that includes fixed dates for submission of assignments and sitting examinations.

5. The inflexibilities of flexible teaching and learning

While flexible delivery of teaching and learning provides many benefits to both students and academic staff, systems of flexible delivery of education can also introduce many new considerations that are not part of traditional on-campus classroom teaching, and may not be immediately obvious to those not involved in flexible delivery. The follow sections identify the ‘inflexibilities’ that may arise under each of the elements of flexibility as identified above.

5.1 Modular curriculum

Most flexible learning systems employ some form of modular curriculum, where the entire program, year level, semester or even unit/subject are organised into discrete, separable sections of content. Modularization offers the advantage of being able to customise a study program based on individual student needs, being able to rearrange combinations of content into alternate units of study or new programs/courses, and it divides the content development task into smaller, more manageable chunks (Briggs 1995). Brown and Saunders (1995)
identify several of the challenges posed by modularization of curricula. Two in particular are described below:

While a major advantage with modularization is student choice, awards that are recognized by many professional associations are not allowed to stray far from a set route or pathway.

Engineering accreditation bodies around the world are moving toward systems based on demonstrated graduate attributes and competencies, and away from systems based on rigidly prescribed course contents. This is likely to increase course flexibility and student choice in all study areas. Modularization does challenge the assumption about the importance of year-long integrated study programs, and it can lead to the compartmentalisation of knowledge, rather than integration across the full curriculum:

...some staff worry about students not making crucial theoretical and methodological links between modules. ...This may be especially the case for combined or independent studies students where lecturers may not have planned or anticipated the choice of certain kinds of pathway or module permutations.

As many engineering schools move toward an integrated curriculum and/or problem based learning strategies, there is a challenge to flexible, modular engineering programs to provide a high level of integration across their many, potentially isolated course components. Course content and assessment tasks in individual modules/units should seek to place new knowledge in an engineering context, and make explicit links to other areas of the student’s studies. One approach to explicit integration in a modular course is the inclusion of a
‘capstone’ unit that draws together and connects the wide range of knowledge and skills developed by students in their studies. A major engineering design project may be an appropriate context for such a capstone exercise (Noble 1998).

The reasons many students find flexible study programs attractive are also the same reasons that can lead to students in these programs departing from a ‘normal’ study pattern (Morgan 1997). Students with advanced standing exemptions and/or studying part-time may find progression through the normal course sequence is not possible because they have not yet completed a required prerequisite unit, or the only unit of study they can select for the current semester comes from a higher year level. Once you permit flexibility in a study program, it is only a matter of time before students trying to fill up their study semester will discover unusual combinations and sequences that are theoretically permitted by the course structure, but never intended. In an environment of modular study the hierarchy of unit prerequisites needs to be carefully designed and tested. At Deakin it is possible to find students enrolled in units from three year levels during the same semester. In such an environment, student cohorts fragment, with many students undertaking what is effectively an individual study program. This causes large problems for the scheduling of on-campus classes; it is virtually impossible to devise a timetable that does not contain class clashes where students study units from multiple levels in the course. In this situation, the only option the student may have is to switch to off-campus study mode to complete a unit that clashes.

5.2 Recognition of prior learning

Recognition of prior learning (RPL) plays a central role in flexible teaching and learning. In engineering education it is an essential part of creating pathways for engineering associates
and para-professionals to articulate to higher occupational categories. Where either block or unit-by-unit credit for prior learning may be granted, similar considerations to modularization regarding the student’s study path and prerequisites need to be taken into account. Where advanced standing is granted, academic staff must be confident the student possesses the required prerequisite knowledge for the balance of their study program, and that students will attain all the required attributes and skills by the completion of their studies. Under RPL schemes, it is common for mature-age students to be routinely exempted from a number of units (particularly those in the early years of the program) as advanced standing. ‘Essential’ course content should not be placed in units that are subject to exemption under RPL.

The process of assessing and granting RPL for each individual student claiming advanced standing may be difficult and time consuming. Judgements must be made about both the content of prior studies and the student’s mastery of the material. The experience of the author relates to relatively large student cohorts at Deakin, and the basis for assessing RPL includes:

- official unit descriptions published by institutions where prior formal studies have been undertaken;
- official academic transcripts of results from prior formal studies; and
- officially witnessed statements by applicants documenting their prior workplace experience, and/or non-credentialled education and training, and/or experiential learning.

This process can be protracted as the student seeks documentation of their prior studies and/or academic staff carry out investigations into courses completed by the student. The
process can become particularly subjective where a student can demonstrate prior mastery of a proportion of the content of a unit in the program they are applying for. This process is facilitated by clear guidelines for the granting of RPL and developing a knowledge base of the permissible credit transfer from commonly encountered institutions and/or programs of prior studies. A key principle of RPL must be the granting of maximum exemptions that are consistent with the prospect of student success; there is no point in forcing students to undertake / duplicate unnecessary studies; conversely, it does a student no good to be granted advanced standing only to find they do not have the prerequisite knowledge required for success later in their course of study.

Flexible learning programs with RPL mean a significant proportion of students may be mature-age and may have many years of experience working in the engineering workforce, including extensive practical experience. It is not uncommon for mature-age students to possess more knowledge and practical experience than their academic counterpart in particular subject areas. Engineering students with practical experience of the ‘real world’ are more than happy to highlight deficiencies, simplifications and other shortcomings in study materials. The maturity and practical experience of mature-age students need to be acknowledged and catered for; they are looking for knowledge and skills that will underpin their current practice with theory, and that they can apply in their workplace. One approach to contextualising the content of the course is to include assessable assignment tasks that require the student to use their own workplace as a case study for the analysis and application of the course content. For example, it is possible to ask students to identify the approaches/methodologies used by their organisation in addressing issues and processes covered in the course. For on-campus students and those without workplace experience, an
exercise in locating a relevant case study from the literature can provide the context for the analysis, as well as developing investigation and research skills.

5.3 Learning resources

The traditional distance learning resources are print-based study guides. Flexible learning materials take advantage of all available media including face-to-face lectures for on-campus students and those off-campus students that can attend, print-based materials, video and audio tapes, home experimental kits, CD-ROMs, residential sessions, computer programs and simulations, teleconferencing, e-mail and the Internet. Flexible learning employs many new and traditional teaching technologies, and the pre-eminent consideration in the selection of a teaching technology must be its appropriateness for the task required. For instance, simply placing existing print-based study materials onto the Web ‘because you can’, to ‘save money on printing notes’ or because ‘someone else is doing it’ is not an effective use of the teaching potential of the Web. The print medium is a valid and cost-effective means of delivering material that works well in print. The Web and other ‘new media’ should be reserved for appropriate applications that add value to the teaching and learning process (Emdad 1991).

There are many advantages in converting course material to print and/or other media. The course can be delivered to remote students who can study at the time of their choosing. Through the appropriate selection of a range of media, a range of learning experiences can be offered that replace, supplement or enhance traditional on-campus teaching. However, these advantages have to be weighed up against a new set of issues that arise in the development of flexible learning resources.
Preparation of flexible learning materials is very costly, principally in the time of academic and editorial staff to develop quality master courseware, but also in the duplication and distribution of the material delivered to students. What works well in a lecture setting may not work well in print, and simply reproducing print material on a computer screen can also deliver a poor result (Emdad 1991). Instructional design issues become critical in producing quality course material; either academic staff must become ‘experts’ in this field, or instructional design input must be closely incorporated into the course material development process. The typical approach to the production of flexible learning materials is to create a unit ‘team’ that incorporates expertise in academic content, instructional design and editorial review. The group has to be co-ordinated carefully to ensure the required outcome is produced in the required time frame. Careful consideration must be given to reconciling the desire to offer a particular unit or course in flexible delivery mode and the economic feasibility of recouping the cost of development.

The delivery of a course changes from a service that is created and delivered in real-time in a lecture, tutorial or laboratory setting, to a product that must be manufactured in a factory and delivered to remote customers. The analogy to industrial production is very close; the production of flexible learning materials involves the design of the product, the planning of production, the assembly of the required human, material and financial resources, the development and evaluation of product prototypes, the freezing of design changes, the commitment to mass production, the control of production, the storage of product inventories, the delivery of products to customers, after sales service to ensure customers received the correct product and are operating it correctly, and a quality improvement process to ensure the product market share is retained and developed.
The move to an industrialised form of education delivery brings with it many of the issues that face other manufacturers of commercial products. Flexible learning materials must be developed long in advance of the time of delivery to allow for the time required for production and transport. In the author’s school, Unit Guides (which contain details of academic contacts, semester timetable, assignment questions, etc.) that accompany flexible study materials to be used by students in semester one must be handed over to editorial staff in the first week of August of the preceding year, that is, more than six months before delivery to students. This means the running of the semester and the details of the unit assessment must be carefully planned long in advance, so the Unit Guides are accurate at the time of use.

To maximise utilisation of production capacity, as well as reduce peak production loads, it is not uncommon for more than one year’s worth of study materials for a particular unit to be produced in a given run. The ‘convenience’ of having stock on hand has to be balanced against the pressure not to make any revisions to unit materials for up to two years, lest the big investment in inventory have to be scrapped. An additional emerging delaying factor is the on-going effort required to maintain study materials after the initial development phase. Developments in technology, changes to the course structure or simple errata mean it is often desirable to update the course material. Unit revisions may have to compete with a widening array of new unit offerings under development and fixed or shrinking editorial capacity. Unit revisions may be limited (except in exceptional circumstances) to once every two years, with continuing pressure to push back jobs in the editorial schedule. The bottleneck here is not the ability of academic staff to produce course content, but the capacity of the limited editorial resources to transform/revise the content into finished courseware.
All of these practical factors related to inertia in the production system tend to limit the flexibility of the course content, and go against the trend in manufacturing toward responsiveness based on strategies such as just-in-time and concurrent development. There are some additional factors that limit the flexibility of flexible learning materials. While course material remains within the boundaries of the print media, educators generally enjoy some freedoms under the provisions of the relevant copyright laws in relation to print materials to be used for educational purposes. However, these freedoms normally apply to facsimile copying only; they do not extend to reproduction or transmission by electronic means (Learning Resources Services 1998). Experience has shown copyright holders are reluctant to give permission and/or demand significant royalties for the use of educational material in electronic media such as CD-ROMs or the Internet.

Economies of scale are achieved by setting the same assessable tasks (i.e., assignments and exams) for both on- and off-campus students. Once this is done, however, care must be taken to ensure all students have access to the same set of learning resources. The immediacy of the classroom means there is the opportunity to introduce additional material to enhance the learning experience. In a flexible program, if you wish to introduce any new core material that might later form part of an assessable task, this material must generally be reduced to print and then forwarded to off-campus students as well. The commitment to a static set of flexible learning resources works against any dynamic adjustments of the course content.

The more ‘flexible’ the learning resources are designed to be, the wider the range of students they must cater for and the more general they must become. For example, consider material covering occupational health and safety (OHS) initially prepared for manufacturing students
principally from a single state or province. As the audience broadens to encompass other engineering disciplines, students may ask, 'why are all the examples are about manufacturing?' As the audience broadens to encompass enrolments from other states, students may ask, 'why are all the examples about the Victorian Occupational Health and Safety Act 1985?' As the audience broadens to enrolments from other countries, students may ask for examples from their own localities. As the audience broadens, it is more difficult to cater for everyone’s individual needs.

There are additional factors that may limit the flexibility of flexible learning materials. Centrally produced study packages cannot cater for the infinite diversity of advice and support required by flexible learners; flexible learning packages are ‘on display’ for the world to see and judge, and hence may be overly heavy in content; and the behaviourist approach taken by many instructional designers leads to an ‘objective mastery’ approach to course presentation, which may tend to rigidly define and ‘close’ the curriculum (Paul 1990).

5.4 Two-way communication

The addition of flexible-study mode students to the class can pose difficulties and bring benefits. Many flexible study students are mature-age, with experience of the engineering workforce; this can be a valuable asset and a real-world contribution to class discussion. Many flexible mode students will study off-campus, so to avoid isolation, ways must be found to ‘bring them into the class discussion’ (Barker et al. 1998). One-way communication can occur with printed study notes, but more effective learning can occur where there are means for student–teacher and student–student communication. Telephone, fax and e-mail communication can be very effective for point-to-point communication, and multi-point teleconferencing is possible. Recent developments in Internet-based, computer-
mediated communication (CMC) have opened up new and rich opportunities for collaboration and communication at a distance (Weller and Hopgood 1997). The increasing availability and adoption of Internet communications technology has seen the development of both asynchronous conferencing systems (such as newsgroups and bulletin boards) and synchronous conferencing systems (such as Internet Relay Chat and Web-based equivalents).

While it is difficult to generalise about the nature of communications with flexible mode students, personal experience suggests that while off-campus students generally seek communication with academic staff less frequently than their on-campus counterparts, the ‘quality’ or depth of their inquiries is typically more involved. Because off-campus inquiries often occur asynchronously (i.e., the message arrives by fax, voicemail, e-mail, etc.), it can consume a significant amount of time to respond in written form (fax, e-mail, etc.) and/or make one or more phone calls to reach the student and respond in person.

One-to-one communication with remote students can be time consuming; but creating a one-to-many (i.e., bulletin board) or many-to-many (i.e., computer conferencing system) enhanced communication environment is an even greater undertaking. The new administrative load can involve learning how to operate the conferencing system, setting up the conferencing environment, supervision, housekeeping, responding to direct inquiries or general questions from the group, moderation of discussions and production of summaries or digests of discussions.

While it is desirable to have timely communication with off-campus students generally, it is very important that assignments submitted through the post are assessed and returned with
meaningful feedback in the shortest time-frame possible. The issues of delay in returning assignments and brevity of written feedback are perhaps the two most common complaints of off-campus students. If the university has a central off-campus operations department that handles assignment submissions and returns, then this may add several days to the turn around time for assignments. There is an imperative placed on academic staff operating in a flexible environment to process off-campus assignments in the shortest time practical.

While computer-based communication has been a positive development for flexible learning in that it has created an accessible, two-way discursive avenue for remote students, it is important to keep in mind that many students studying in the flexible mode are mature-age, and they may have had limited exposure to computers before returning to study. Care must be taken to ensure any electronic communication systems offered to these students are easy to use and do not require students to make large financial outlays for specialised computer equipment.

5.5 Other issues

There is a large range of other issues related to flexible teaching and learning programs. Engineering, by its nature, contains a significant practical/vocational element. The provision of satisfactory laboratory/practical experiences for off-campus engineering students requires novel solutions (Walkington et al. 1994, Weller and Hopgood 1997). The flexible approach to laboratory work requirements at Deakin encompasses:

- exemption if the student can provide satisfactory evidence of prior experience;
- development of home experimental kits for appropriate units, such as electronics and basic materials experiments - home experimental kits have been used effectively in
teaching science and technology fundamentals, it is even suggested that they may increase learning by providing students with extra time to gather data and solve problems (Kennepohl and Last 1997, Carr 2000);

- provision of intensive, on-campus practical sessions for several units at a time, delivered by the same staff/demonstrators who present practical sessions for on-campus students, normally timetabled on weekends, so off-campus students may travel, attend the university and complete their practical requirements infrequently - this approach is used widely in distance education programs requiring laboratory work (Ember 1996); and
- individual arrangements where the student negotiates to conduct the required laboratory work using the facilities of their workplace or another educational institution closer to them.

A common element found in engineering undergraduate programs in many parts of the world is a requirement for students to complete a major design project and thesis in the senior year(s) of their study. At Deakin, on-campus students can complete this work under the guidance of academic staff, using university facilities and/or in conjunction with an industrial partner. Students studying off-campus may not be able to conveniently access the facilities of the university, but it has been found that these students are generally already employed by engineering organisations, and normally tackle a real, work-based problem as their major project, and are able to call on organisational resources that far exceed those available to their conventional on-campus counterparts.

The awarding of advanced standing, carrying forward of incomplete results until off-campus students can fulfil unit practical/laboratory work requirements, frequent variations to individual enrolments, and the possibility of a 16 year, part-time completion time for a
degree can all play havoc with systems of prerequisites and central student administration systems designed around conventional progress through a three or four year program of study. Staff participating in the delivery of such flexible programs require access to both the appropriate training and development to provide them with the new skills they require to contribute effectively, and to a reward scheme that recognises and values the new type of work required to develop and deliver flexible mode teaching and learning materials. An emerging issue in flexible delivery of education programs is the development and delivery of on-line study programs. This important issue is beyond the brief discussion presented in this paper (Palmer 1998).

6. Conclusions

Flexible delivery of engineering and technology education will continue to play an important role in opening up higher studies to students previously unable to access conventional study programs. While flexible delivery of teaching and learning provides many benefits to both students and academic staff, systems of flexible delivery of education can also introduce many inflexibilities that are not part of traditional on-campus classroom teaching. The key issues / challenges for flexibility in flexible mode programs in engineering and technology are not significantly different from those in any educational discipline seeking flexible delivery, they include the 'pros' and 'cons' listed in table 1.

[Insert table 1 about here]

This paper concludes that as engineering education incorporating flexible delivery moves further into the mainstream, an awareness of these issues will be crucial for those involved in
flexible teaching and learning systems, as well as those considering implementing such systems.

References


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### Table 1 - Pros and Cons of flexible delivery of engineering education

<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
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<tbody>
<tr>
<td>Flexible delivery opens up engineering education to non-conventional students.</td>
<td>Lack of a coherent/consistent definition as to what constitutes 'flexible delivery'.</td>
</tr>
<tr>
<td>A modular curriculum is re-configurable to suit different student groups and may be developed incrementally.</td>
<td>Rigid course accreditation requirements may preclude course flexibility. Need to ensure integration of knowledge across course modules. Modularization permits a wide range of study sequences.</td>
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<tr>
<td>Recognition of prior learning (RPL) acknowledges the value of prior formal studies and practical workplace experience.</td>
<td>Mature age students may be routinely exempted from Foundation studies. RPL assessments can be time consuming. Consistency is required in RPL assessments.</td>
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<tr>
<td>Flexible delivery may incorporate multiple media and remote delivery, catering to a wider audience and differing learning styles.</td>
<td>Teaching is changed from the delivery of a service to the creation of a product. Instructional design and editorial skills must be combined with academic expertise. The development of print-based, on-line and other material can be very expensive. Committing content to print or other media reduces flexibility and responsiveness. A wider audience means catering to a more diverse array of student needs/capabilities. More stringent copyright restrictions generally apply to media other than print.</td>
</tr>
<tr>
<td>Flexible delivery creates new opportunities for communication and collaboration via electronic channels.</td>
<td>Infrastructure/systems must be in place to support electronic communication. Students must have access to the Internet. Design and maintenance of on-line communication forums can be significant. Communication via post can introduce significant delays. Systems must be in place for remote delivery of required practical work. Part-time/remote study programs may cause problems for administration systems geared to on-campus students. Academic staff development is critical in the success of flexible study programs.</td>
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