Creativity and Innovation Toolkit

Purpose of this Toolkit
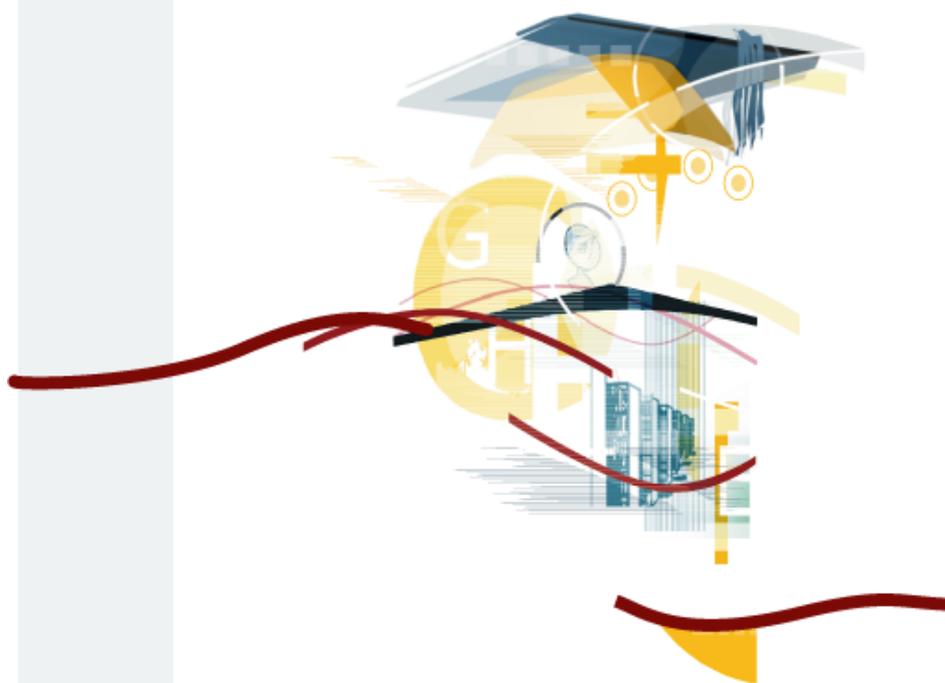
The Toolkits developed by members of the Griffith Graduate Project are intended primarily for academic staff. They offer an overview of some of the main issues related to developing students' graduate skills during their degree studies.

They draw heavily on existing literature and current practice in universities around the world and include numerous references and links to useful web resources.

They are not comprehensive 'guides' or 'how to' booklets. Rather, they incorporate the perspectives of academic staff, students, graduates and employers on the graduate skills adopted by Griffith University in its Strategic Plan, 2003-2007 in the Griffith Graduate Statement:

http://www.griffith.edu.au/ua/aa/plans/docs/strategicplan2003-2007.pdf.

A new Statement was adopted by the University in 2004. Two additional Toolkits, Creativity and Innovation, and Ethical Behaviour, have been developed to align with the new Griffith Graduate Statement.

This toolkit, *Creativity and Innovation*, focuses on how you can help students to think and learn creatively and develop their innovative skills while at university.

This toolkit, together with others in the series including:

- Analysis and Critical Evaluation;
- Information Literacy;
- Written Communication;
- Oral Communication;
- Professional Skills;
- Problem Solving;
- Teamwork; and
- Ethical Behaviour

can also be accessed on the Web at:
http://www.griffith.edu.au/centre/gihe/griffith_graduate

Please note:

The links to external web sites from the Toolkits will break from time to time and become inaccessible. All links were functional at the time of publication, but if you require hard copies of any of the print and web resources referred to in the Toolkits please contact Lynda Davies at GIHE (ph. 07 3735 5982; email: L.Davies@griffith.edu.au).

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Why your students need to be creative and innovative

Creative, innovative graduates are in demand! Richard Florida, author of *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life* (2002) and *The Flight of the Creative Class: The New Global Competition for Talent* (forthcoming) said, during a public lecture hosted by Griffith University on 24 February, 2005, that in Australia at the present time, "between three and four million out of nine million in the workforce are in the creative sector of the economy." He described the creative sector as "the new growth force of our economy."

The world is changing so rapidly that graduates must be creative, innovative, and able to adapt to new situations:

"…people need to be able to adjust to change that is both rapid and sweeping, both for their own well-being and for that of the societies in which they live. This means that education will need to foster flexibility, openness, ability to produce novelty, ability to tolerate uncertainty and similar properties – in other words, creativity."

Cropley, A.J. (2001). *Creativity in Education and Learning: A Guide for Teachers and Educators.* London: Kogan Page, p. 158.

'Creativity and flair' were the two graduate abilities most often found lacking by a sample of Australian employers who participated in the AC Nielsen research study, *Employer Satisfaction with Graduate Skills* (2000).

AC Neilsen Research Services. (2000). *Employer Satisfaction with Graduate Skills.* Retrieved from the World Wide Web on 4 April, 2005: http://www.dest.gov.au/archive/highered/eippubs/eip99-7/eip99_7pdf.pdf

"The various facets of 'initiative and enterprise that contribute to innovative outcomes' were identified in *Employability Skills for the Future* (2002) as:

- Adapting to new situations;
- Developing a strategic, creative, long-term vision;
- Being creative;
- Identifying opportunities not obvious to others;
- Translating ideas into action;
- Generating a range of options; and
- Initiating innovative solutions.

The Australian Chamber of Commerce and Industry and The Business Council of Australia. (2002). *Employability Skills for the Future.* Canberra: AGPS, p. 9. Retrieved from the World Wide Web on 18 May, 2005: http://www.acci.asn.au/text_files/reports/Employability_Skills.pdf

CREATIVITY AND INNOVATION

Definitions

Creativity is not confined to the visual and performing arts – it is an essential ingredient of all disciplines and professions.

Creativity is the ability to make something new, whether a thought or idea, an object, a product or a process, a work of art or performance, or an interpretation. Usually, this involves making connections with an existing knowledge base, using imagination, experimenting, taking risks, having fun and making the jump from what is already known or experienced to what is, or might be. Creativity is a difficult concept to pin down, but here are some definitions that reflect its complexity:

"Personal creativity is: a process of becoming sensitive to or aware of problems, deficiencies, and gaps in knowledge for which there is no learned solution; bringing together existing information from the memory storage or external; defining the difficulty or identifying the missing elements; searching for solutions, making guesses, producing alternatives to solve the problem; testing and re-testing these alternatives; and perfecting them and finally communicating the results."

Morrison, A., & Johnston, B. (2003). Personal creativity for entrepreneurship: Teaching and learning strategies. *Active Learning in Higher Education, 4*(2), pp. 145-158.
Retrieved from the World Wide Web on 4 April, 2005:
http://alh.sagepub.com/cgi/reprint/4/2/145

"The creative individual is a person who regularly solves problems, fashions products, or defines new questions in a domain in a way that is initially considered novel but that ultimately becomes accepted in a particular cultural setting."

Gardner, H. (1993). *Creating Minds. An Anatomy of Creativity Seen Through the Lives of Freud, Picasso, Stravinsky, Eliot, Graham and Gandhi.* New York: Basic Books, p. 35.

"Creativity…involves departing from the facts, finding new ways, making unusual associations, or seeing unexpected solutions."

Cropley, A.J. (2001). *Creativity in Education and Learning: A Guide for Teachers and Educators.* London: Kogan Page, p. 23.

Cropley (2001) identified three main vehicles for creativity:

- products;
- people; and
- the environment.

He argues that creativity can manifest itself in:

- *products* that take the form of works of art, musical compositions, written documents, machines, buildings, or other physical structures such as bridges; in plans and strategies for solving problems in business, manufacturing, government, etc.; in thoughts or ideas - systems for conceptualising the world (e.g., philosophy, mathematics, or indeed all reflective disciplines);

- *people,* through clusters of psychological factors involving abilities, knowledge, skills, motives, attitudes and values, as well as personal properties such as openness, flexibility or courage – some of which are inherited, but some of which can be learned; and

- *environment* by factors such as tolerance for novelty, encouragement and recognition, contact with models of creative behaviour and exposure to works of art, literature, and people who foster creativity.

Adapted from: Cropley, A.J. (2001). *Creativity in Education and Learning: A Guide for Teachers and Educators.* London: Kogan Page, p.p. 6-7.

"Being innovative is closely related to being creative. Seeing possibilities, seizing opportunities, creating new ventures, markets or products are all part and parcel of innovation. An innovator is someone who has an idea, sees its potential, and sets about promoting, or advocating it to a wider audience, often with profit in mind. In this sense, entrepreneurship is closely related to the term 'innovation.' In 2003, the National Commission on Entrepreneurship (UK) defined entrepreneurship as 'the process of uncovering and developing an opportunity to create value through innovation.'"

National Commission on Entrepreneurship. (2003). Creating Good Jobs in Your Community. Cited in Moreland, N. (2004). *Entrepreneurship and Higher Education: An Employability Perspective.* Retrieved from the World Wide Web on 4 April, 2005: http://www.heacademy.ac.uk/resources.asp?process=full_record&section=generic&id=341

Disciplinary interpretations of "creativity":

Creativity means different things to different people, and in different disciplines. Here's a sample of disciplinary interpretations from academic staff at Griffith University:

Business

In business, the terms are usually associated with "entrepreneurship," or the process of recognising opportunities for new commercial ventures and acting upon them, usually in the face of risk. The skills needed to be an entrepreneur include: observation of the market, insight into customer needs, invention, innovation, a willingness to take risks, securing outside investment, delivering the product or service, financing, marketing and management.

In marketing, Dr Joo-Gim Heaney (Griffith Business School, Griffith University), says that creativity is closely linked with the personal process of coming up with new inventions, processes or ideas. Innovation is more a social process of transforming that invention into a commercially viable product (Barclay & Benson, 1990; Rickards, 1991). In this sense, marketers are looking at creativity as the source of ideas that can hopefully be turned into profitable and useful innovations that meet consumer needs.

Sources:

Barclay, I., & Benson, M. (1990). Success in new product development: The lessons from the past. *Leadership and Organisation Development Journal, 11*(6), p.p. 4-13);

Rickards, T. (1991). Innovation and creativity: Woods, trees and pathways. *R&D Management*, 21(2), p.p. 97-109.

Criminology

Dr Merrelyn Bates, School of Criminology and Criminal Justice, sees creativity in her field as a means of addressing issues and problems in the criminal justice system. For her, the starting point is to understand the criminal justice system, because without this the criminologist would find it had to "know" whether the issue is systemic, resource-based, historical or cultural, etc. Each innovation requires evaluation and ongoing research to ensure that there is ongoing efficacy and currency.

For example, crime affects all sections of our society and as a result, crime prevention strategies are developed in order to address different issues, e.g., the innovative initiatives for curbing graffiti on public buildings adopted by many local councils in Queensland - relevant council sections, police and other appropriate agencies (usually youth-related) meet regularly to identify "hot spots" and develop strategies to curb the graffiti; the pilot program for a drug court; and the "whole-of-government" initiative developed in the court sector to rehabilitate drug offenders, who face correctional sentences only if they lapse.

Creativity and innovation for a criminologist, therefore, are directly connected to applied knowledge.

Design

Mr Paul Barnes, Queensland College of Art, Griffith University, sees four major aspects of creativity in his discipline: an inquisitive mind; a keen eye on the world around; knowledge of the elements and principles of design; and a passion to experiment. In his opinion, they all have roles to play, but, when pressed, says that the fourth is the keystone of creativity.

Engineering

Professor David Theil, from the School of Microelectronic Engineering at Griffith University, sees creativity as requiring a knowledge of the technology, and an understanding of the human condition, both locally and around the world. The latter is far more difficult and can be very individual. Microelectronic engineering is a leading edge technology field that has two objectives – to solve existing problems (market pull), and to create new futures (technology push). All developments are designed to improve the human condition in the broadest of terms. This includes new products created with minimal environmental impact, both from the product itself and its manufacture.

Dr Philip Williams, from Griffith's School of Environmental Engineering, believes that creativity is an important and essential part of environmental engineering. Indeed, part of the rationale for the emergence and development of environmental engineering, he says, was the recognition that in order to solve environmental problems, engineers would need more than the old traditional, and largely technically-focused skills. Thus, environmental engineers recognise it is necessary to think "outside the square" to solve complex issues. Such solutions require a variety of inputs, including, not just technical, but economic, social and environmental perspectives as well. This is often described as an holistic approach, as distinct from the older, "end of pipe," where a problem would be accepted as inevitable and a "technical fix" would be implemented. The holistic approach, therefore, can result in a variety of possible innovative solutions.

Environmental engineering students at Griffith develop their creativity by being exposed to a diverse range of courses, which include the natural and social sciences as well as the usual engineering sciences and mathematics. They learn a variety of viewpoints, e.g., that the environment is fragile, that people are critically important and that their work must be sustainable.

Humanities

According to **Associate Professor Patrick Buckridge**, School of Arts, Media and Culture at Griffith, creativity is intrinsic to the discipline itself. He believes that creativity is a crucial component of all worthwhile work in the humanities disciplines, not just in those areas (Creative Writing, Screen Production) that have tended to monopolise the label, but in the broader academic study of literature, history, language, philosophy, social life and popular culture.

He understands creativity to mean: the ability to discover and articulate new meanings; devise new arguments or syntheses; and find new ways of extending, modifying or contesting existing arguments or syntheses, within a given field of social and cultural phenomena.

The reason that "creativity" is a good term to invoke for this is that the connection between doing all the things you need to do as preparation, on the one hand, and actually coming up with the idea that will lead to the new argument, on the other, can be quite

unpredictable and a bit mysterious, presumably because it comes out of the subconscious mind as it continues to work on problems put to it by the conscious mind.

The creative dynamic to him, therefore, always involves two phases: "immersion" and "articulation." The process of immersion, whether it is in personal "life experience," or in a literary work, an historical period, a particular community or subculture, or a philosophical system, is the necessary prerequisite to a new argument or synthesis – without it, any new argument is likely to be thin and derivative at best, unguided by a personal but holistic understanding of the field that "immersion" can provide.

By the same token, the task of articulating, expressing and communicating is essential, not only in order to transmit new insights to others, but also in order to bring the idea, argument or synthesis itself to completion. Without it, the immersion phase can produce only passive empathy and passive learning

Why students need to be creative and innovative

What employers, graduates and students say about being creative and innovative

Employers' comments

"Being creative is like playing with fire. You need it to stay alive and be outstanding against your competitors, but you have to use it carefully if you don't want to get burned."
(Employer of Griffith Graduates, 2005)

"Creativity is a configuration of the brain which allows the lucky ones to think outside the square and view things in colour. The creative elements add to life its spice and make society a more interesting place to live. Our industry [photography] exists because it has the ability to supply this vital ingredient. It extends our society's conceptual framework, and enriches its cultural content. It is therefore crucial that people with such gifts are concentrated and helped to generate this essence of novelty and discovery. Society, as with snakes, shed their cultural skins from time to time. Creative industries are there to make sure that the new skin is all the more colourful."
(Employer of Griffith Graduates, 2005)

"…and innovation as well – that's a very broad term, and it's not just about inventing things. It's about looking at processes and information flow and communication flow, and making suggestions and being aware of how processes work, and how business works, and assessing and researching it for yourself. That brings value to the organisation, which in turn will have an enormous flow-on to your own career."
(Employer of Griffith Graduates, Careers Fair, 2004)

"[We look for graduates who can] see opportunities. I wouldn't say weaknesses, but opportunities in the business. It's important in our game to stay on top, otherwise we'll get left behind and our market share will diminish, putting our company at risk."
(Employer of Griffith Graduates, Careers Fair, 2004)

"[To engineers, it seems as if the universities use] 'a + b = c – that's the rule' [as a model], and if you put 'd' you are wrong. But in the real world, it doesn't happen like that, because the weather was dark, and therefore the answer was 'b'. You just can't tell. I think that university students come out with [the idea that] 'There is only one answer, and it has to be y,' and they get 100% if they get the right answer, but the real world doesn't work like that. The real world is very much like, 'Which way was the wind blowing?' Stuff happens."
(Employer of Griffith Microelectronic Engineers, 2002)

Graduates' comments

"Being creative can seem a bit risky, but it always adds interest, rarely hurts you, and can give you great rewards if you are willing to follow through with hard work."
(Griffith Graduate, 2005)

"Creativity is the basis of problem solving, which is an important characteristic for the work-ready graduate. To effectively solve problems, you need to consider not only the issues underlying the problem and solutions that others have found, but also to consider quite new strategies – the development of which relies on creative thought."
(Griffith Graduate, 2005)

"Creativity powers change, which is an important consideration in an increasingly competitive and technologically complex marketplace. Creativity can provide a solution to

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a problem; new ideas; the flexibility to see/accept different perspectives; and original and imaginative products and services."
(Griffith Graduate, 2005)

Students' comments

"Creativity in business is simply using one's initiative and taking risks to gain a competitive advantage. It involves thinking outside the square to stimulate new ideas and creations to better a business/product/service. Creativity should be present in every aspect of a business, from the features and benefits of a product/service to the general day-to-day motions of a business to keep up with ever-changing and competitive markets. Creativity is a vital ingredient of a successful business."
(Griffith Student, 2005)

"Creativity is important in my field (engineering), because there is often more than one solution to a problem. Creativity helps explore different options for a solution."
(Griffith Student, 2005)

Employers, graduates and students

Teaching tips—How to help your students be creative and innovative

Developing students' creativity at university

Is it possible to teach students "how" to be creative? By providing a learning climate in which creative thinking is encouraged and valued, academic staff can definitely foster creativity and innovation in their students.

"A talent, or gift for creativity can be inherited by some people, and learned or developed by others. It is not true to say that people just *are* creative, while others aren't – rather that some people find it easier to recognise their creativity and run with it, while others are more hesitant. Recent thinking shows that the ability to think and act creatively can indeed be fostered in the classroom and transferred or applied in different learning contexts."

Brainstorming: We Can Teach "Creativity":
Retrieved from the World Wide Web on 4 April, 2005:
http://lamer.colostate.edu?~aejmcpr/28berger.htm

Some universities have developed specific courses that focus primarily on creative, innovative thinking and problem solving. Academic staff at Harvard University, for example, have formed a centre to help engineers and scientists become more creative and entrepreneurial. The University of Strathclyde in the United Kingdom has developed a specific course:

"'Entrepreneurship: Personal Creativity' [which] is a credit-bearing elective that undergraduate students from any discipline can volunteer to take at any point in their degree studies. Since its introduction in the academic session 1996/97 approximately 200 students have completed the class.

The class runs over 12 two-hour sessions and aims to:

- nurture capabilities of personal and team creativity;
- promote understanding of the nature and role of creativity within a student's individual social and economic contexts;
- overcome barriers to the creative process;
- develop frameworks within which to evaluate creative, entrepreneurial opportunities;
- enhance communication and presentation skills; and
- improve team building and working abilities.

Furthermore, although entrepreneurship is selected as an experiential context to which personal creativity is applied, the key objective of this class is broader in that it is designed to nurture those creative processes and skills that have the potential to be effectively applied within their particular academic, work and social worlds. In addition, specific emphasis is placed on the creative and problem-solving skills of both the individual and team."

Morrison, A., & Johnston, B. (2003). Personal creativity for entrepreneurship: Teaching and learning strategies. *Active Learning in Higher Education, 4*(2), pp. 145-158.

Retrieved from the World Wide Web on 4 April, 2005:
http://alh.sagepub.com/cgi/reprint/4/2/145

Teaching tips

CREATIVITY AND INNOVATION

The Open University, UK, has found that "it is possible to promote students' creativity and innovation if some key conditions are met, namely:

- The curriculum must integrate different techniques for creativity and innovation (brainstorming, group work, etc.);

- Student feedback must be sought in a variety of ways on a range of issues;

- Students must be encouraged to provide a critique of the curriculum;

- The institutional atmosphere must provide a safe environment for experimentation;

- The institutional culture must stress the engagement of all in the learning process, not only students but also lecturers. That is, lecturers must be seen as learners and as facilitators of learning rather than just as teachers;

- Students are required to develop real solutions to real needs in real time.

Innovation and Creativity in the Curriculum
Retrieved from the World Wide Web on 4 April, 2005:
http://www.innovations.ac.uk/btg/resources/publications/innovation.pdf

Queensland College of Art, Griffith University, offers a course, 2545QCA: Creative Thinking, that is open to students from all disciplines. One of its learning objectives is for students to develop "an attitude that accepts the unknown." By enrolling in this course, students embark on an "adventure", in which there is no clear destination. Students are warned that exercising their creativity is "a painful and frustrating experience. YOUR BRAIN WILL HURT. You're not here for a nice time, but to extend yourself." The course is described in this way:

"Creativity is about originality and innovation and not about repeating what has already been done. This means you expose yourself to the possibility of failure. There are risks associated with extending personal boundaries. There is a mindset needed to go beyond personal comfort zones. An understanding of risk – and how to learn from it – along with the mindtools needed to develop creativity, are the components of the course."

Course Outline: 2545QCA: Creative Thinking
Retrieved from the World Wide Web on 4 April, 2005:
http://www.ua.gu.edu.au/subject_outlines/QCA/2004/s2/2545QCA.pdf

Principles for curriculum design

Some fundamental principles underlie curriculum design for creativity and innovation. These include:

Designing curricula that foster:

- Development of appropriate thinking skills;

- Acquisition of positive attitudes to creativity and creative performance;

- Motivation to be creative;

- Perception of oneself as capable of being creative;

- Reduction of anxiety about creativity; and

- Positive attitude and mood in problem-solving situations.

Clapham, M.M. (1997). Ideational skills training: A key element in creativity training. *Creativity Research Journal, 10*, pp 33-44.

Teaching tips

Making "being creative and innovative" part of learning:

- Encourage students to generate lots of ideas – some of them will be creative and original – in group brainstorming sessions, and individually;

- Get students to see things from different perspectives – take a different approach – ascribe them particular "professional roles" (e.g., an accountant; a lawyer; a project manager; a gallery director; a stage producer) to change their point of view;

- Ask them to build on and expand existing ideas to arrive at new ones;

- Recognise the importance of asking questions and being inquisitive;

- Ask students provocative questions, e.g., "What would happen if…?";

- Encourage and reward risk-taking by providing genuine support;

- Assure students that they *can* be creative;

- Allow time for students to think.

Giving students plenty of practice in solving problems creatively:

Finding and framing the problem to be solved is often the most creative part of problem solving. Encourage students to recognise problems when they see them, try out a range of possible solutions, and then evaluate the most effective fit between the problem and its solution.

"An important aspect of problem solving is the distinction between solving by eliminating a difficulty or removing an impediment, and solving in the sense of envisaging, posing or formulating questions that need to be raised in order to deal more effectively or elegantly with an existing situation."

Cropley, A.J. (2001). *Creativity in Education and Learning: A Guide for Teachers and Educators*. London: Kogan Page, p. 48.

Encouraging students to "think like innovators":

- Engage students in group brainstorming sessions;

- Ask students to consider not just one, but two or more alternative problems, and solutions – use the "what if?" approach;

- Suggest they keep a comprehensive journal of their thoughts, ideas and experiences – a Visual Diary is ideal – as some of them might be worth developing;

- Suggest students use a tape-recorder to note down their thoughts and ideas throughout the day;

- Introduce them to concept mapping to make connections between ideas;

- Engage them in word association exercises (for the same reason).

Sharing examples of creative, innovative thinking from inside and outside the classroom, from a range of disciplines:

Below are some of the best-known examples of "serendipitous" creations:

Teaching tips

"Nikola Tesla, the technological genius whose list of inventions includes the fluorescent light and the A-C generator, 'could project before his eyes a picture, complete in every detail, of every part of the machine. These pictures were more vivid than any blueprint.' Tesla's inner imagery was so like perceptual imagery that he was able to build his complex inventions without drawings. Further, he claimed to be able to test his devices in his mind's eye 'by having them run for weeks – after which time he would examine them thoroughly for wear.'"

McKim, R..H. (1980). *Thinking Visually*. Belmont, Calif.: Lifetime Learning Publications, p. 10.

"In 1896, he [Becquerel] is said to have left a photographic plate and a container with uranium salts in it in a drawer. On opening the drawer he noticed that the photographic plate had fogged. This unexpected event piqued his curiosity. He eventually concluded that the uranium had emitted some kind of radiation, which was responsible for the fogging. He then showed that this differed from X-rays in being deflected by electromagnetic fields, i.e., it was a previously unknown phenomenon. After initially being called 'Becquerel rays' the radiation subsequently became known as 'radioactivity' and ultimately led to Becquerel sharing the 1903 Nobel Prize for physics with Marie and Pierre Curie."

Cropley, A.J. (2001). *Creativity in Education and Learning: A Guide for Teachers and Educators*. London: Kogan Page, p. 20.

"One often-cited example of creativity is George de Mestral's observation of how cockleburs attach to clothing, which led him to invent the hook-and-loop fastener known as Velcro®. He transformed a common nuisance to a useful product. When one looks backward in time to analyse how a creative act was made, one often finds that creators made a novel interpretation of a well-known fact or occurrence. Often the interpretation converted a disadvantage into an advantage."

Creativity in science and engineering
Retrieved from the World Wide Web on 4 April, 2005:
http://www.rbs0.com/create.htm

Some teaching and learning strategies to develop creativity

Brainstorming:

With students in small groups:

- Write the initial topic or problem on a whiteboard – make it short, clear and focused.

- Check that everyone understands the problem or issue

- Review the ground rules:
    o No criticism or judgement of ideas. All ideas are equally valid.
    o The more ideas generated, the better the solution.
    o Don't censor any ideas; keep the meeting flow going.
    o Listen to ideas, and try to piggy-back on them to other ideas.
    o No discussion of ideas or questions in the brainstorming stage, as this stops the flow of ideas.
    o Choose one student as facilitator to keep the ideas flowing and record them.
- Generate ideas - either in an unstructured way (anyone can voice an idea at any time) or structured (sequentially around the table, allowing people to pass if they have no new ideas).

▪ Clarify and conclude the session. Combine identical or very similar ideas and keep all the others. It is useful to get consensus on which ideas should be looked at further and where (and when) to go from here.

Adapted from: Creativity Techniques
Retrieved from the World Wide Web on 4 April, 2005:
http://www.mycoted.com/creativity/techniques/index.php

Fishbone diagram:

The fishbone diagram (see below), originally developed by Professor Kaoru Ishikawa, is often referred to as an Ishikawa diagram. The technique is used to identify possible causes of a problem. The diagram encourages students to develop an in-depth and objective representation and to keep on track. It discourages partial or premature solutions, and shows the relative importance and inter-relationships between different parts of a problem.

Ideally, the method is used over a number of meetings, enabling the team to become deeply immersed in the problem. Fresh suggestions regarding possible causes can arise during breaks and members are likely to forget who originated every idea, thus making subsequent discussions less inhibited.
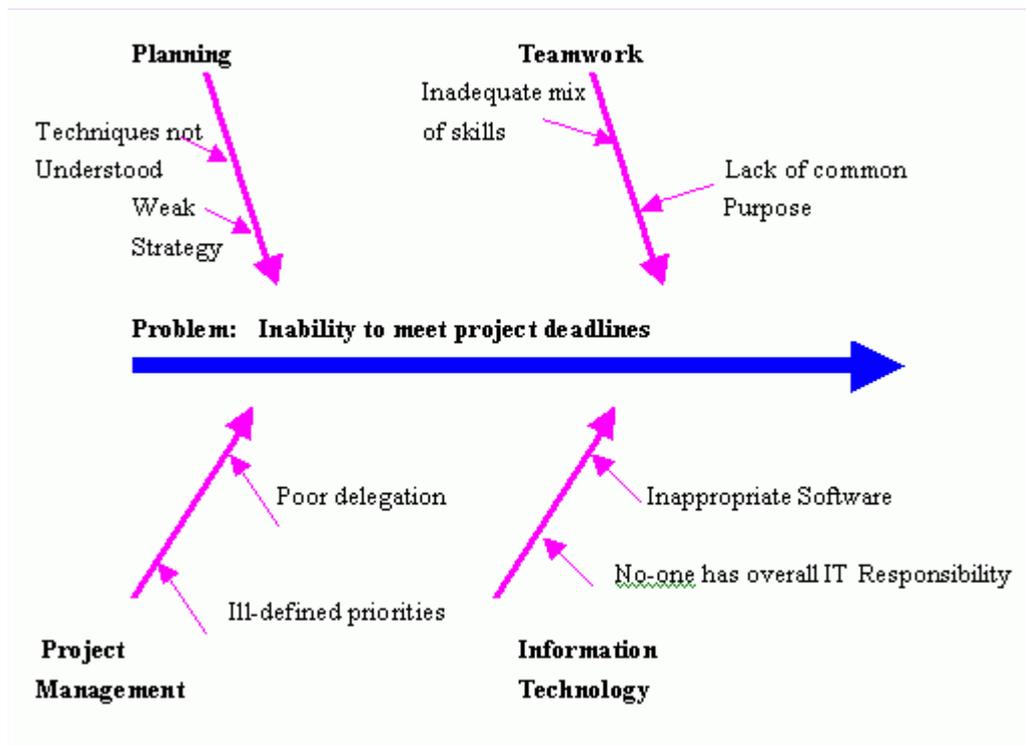
The procedure is as follows:

▪ On a large sheet of paper, draw a long arrow horizontally across the middle of the page pointing to the right, and label the arrowhead with the title of the issue to be explained. This is the "backbone" of the "fish."

▪ Draw spurs coming off the "backbone" at about 45 degrees, one for every likely cause of the problem that the group can think of; and label each at its outer end. Add sub-spurs to represent subsidiary causes. Highlight any causes that appear more than once – they may be significant.

Teaching tips

- The group considers each spur/sub-spur, taking the simplest first, partly for clarity but also because a good simple explanation may make more complex explanations unnecessary.

- Ideally, the diagram is eventually re-drawn so that position along the backbone reflects the relative importance of the different parts of the problem, with the most important at the head end.

- Circle anything that seems to be a "key" cause, so you can concentrate on it subsequently.

Adapted from: Creativity Techniques
Retrieved from the World Wide Web on 4 April, 2005:
http://www.mycoted.com/creativity/techniques/fishbone.php

Free Association

Free association contains elements of several other idea-generating techniques and depends on a mental "stream of consciousness" and network of associations of which there are two:

Serial association: start with a trigger, record the flow of ideas that come to mind, each idea triggering the next, ultimately reaching a potentially useful one.

Centred association (which is close to classical brainstorming): prompts you to generate multiple associations to the original trigger so that you "delve" into a particular area of associations.
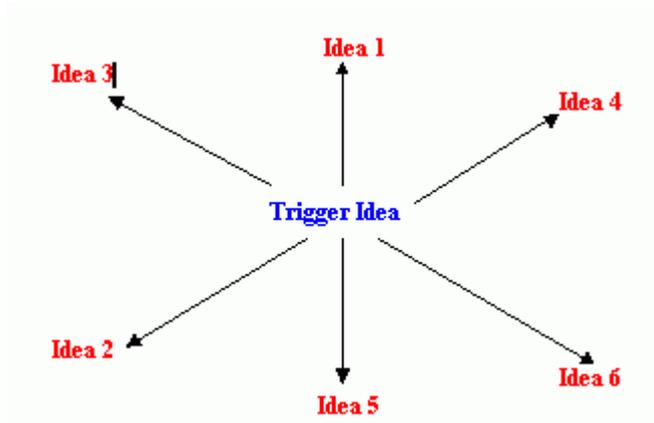
As a rule the serial mode is used to "travel" until you find an idea that you find of some interest, you then engage the centred mode to "delve" more deeply around the interesting item. Once you have exhausted the centred investigation, you begin to "travel" again, and so on. Three hints:

- Suspend judgement. Try not to repress your natural flow of thoughts. Unusual ideas, that may seem "off the wall" are perfectly acceptable, so you can say whatever you think.

- Follow the intriguing ideas and look for those that attract your attention as particularly strong, intriguing, surprising, etc. even if they don't seem instantly appropriate to your problem. This attraction frequently signals links to a useful set of associations, and so could possibly justify a further phase of centred, free association around the "attractive" idea.

- Use solution-oriented phrasing. The idea "blue" is not much use as it stands. However, when transformed into a phrases such as the following, it may lead to an alternative solution:

Teaching tips

o   "Could we colour it blue?'"
o   "In what ways might I make it blue?"
o   "I wish it were "bluer?"
o   "How might it help it if were bluer?"

Adapted from: Creativity Techniques
Retrieved from the World Wide Web on 4 April, 2005:
http://www.mycoted.com/creativity/techniques/free-association.php

Mind Mapping

Mind mapping represents ideas, notes, information, etc., in far-reaching tree-diagrams. To draw a mind-map:

- Lay out a large sheet of paper in landscape format and write a concise heading for the overall theme in the centre of the page.

- For each major sub-topic or cluster of material, start a new major branch from the central theme, and label it.

- Each sub-sub-topic or sub-cluster forms a subordinate branch to the appropriate main branch.

- Carry on in this way in ever finer sub-branches.

It may be appropriate to put an item in more than one place, cross-link it to several other items or show relationships between items on different branches. Coding the colour, type of writing, etc., can do this. Alternatively, drawings in place of writing may help bring the diagram to life. Software packages are available that offer support with mind-maps, making it easier to amend and reshuffle the map. They often hold notes and documents, etc., associated with the labels (so acting as a filing system).

Adapted from: Creativity Techniques
Retrieved from the World Wide Web on 4 April, 2005:
http://www.mycoted.com/creativity/techniques/mindmap.php

Other People's Viewpoints

Edward de Bono and others suggest role-playing is particularly suited to people problems, where three or four parties have different views about a situation, and it works well with a group of 16 or so. It is a means of achieving multiple perspectives on the issue under consideration. It can be used with groups of student teams working on projects.

- Create a list of the key three or four people or roles involved in the problem area and get the "client" (who could be the lecturer/tutor, one of the students, or an external person) to describe the people and roles concerned and to answer enquiries.

- Separate the group into small team and allocate one role to each team, then each group should attempt to "get into the shoes" of its role, role-playing it in the full theatrical sense if they are inclined. The intention is to be able to look at the world from this party's viewpoint.

- Either descriptively, or as a role-play, each group should give a presentation of its character's viewpoint to the other groups. The viewpoint should comprise both personal and role-related issues. For instance, any particular role may have some concerns to do with the current project, etc., and others to do with family and personal career, and yet others to do with attitudes, habits, prejudices, etc.

- This can be taken on to a second stage by forming a series of negotiating teams that has one representative from each of the original role teams. Each negotiating team has to try to reach agreement about the issue.

Teaching tips

▪ Finally each group reports back to the others on how they got on.

▪ Take time out to carefully reflect on the events.

▪ A fundamental negotiating technique is to try to spot areas of agreement, partial disagreement and major disagreement, then try to increase the un-controversial areas by attempting to reach agreement on the least tricky areas, where there is partial agreement, leaving the major disagreements till the end. Even in apparently impossible situations, this technique can be surprisingly productive.

Adapted from: Creativity Techniques
Retrieved from the World Wide Web on 4 April, 2005:
http://www.mycoted.com/creativity/techniques/otherpeopview.php

Six Thinking Hats

Early in the 1980s, de Bono invented the Six Thinking Hats method. The method is a framework for thinking and can incorporate lateral thinking. Valuable judgmental thinking has its place in the system but is not allowed to dominate as in normal thinking. The six hats represent six modes of thinking and are directions to think rather than labels for thinking, i.e., the hats are used proactively rather than reactively.

Everyone is able to contribute to the exploration without denting egos as they are just using the yellow hat, or whatever hat. The six hats system encourages performance rather than ego defence. People can contribute under any hat even though they initially support the opposite view. The key point to remember is that a hat is a direction to think rather than a label for thinking. The key theoretical reasons to use the Six Thinking Hats are to:

▪ encourage parallel thinking;

▪ encourage full-spectrum thinking;

▪ separate ego from performance.

There are six metaphorical hats and the thinker can put on or take off one of these hats to indicate the type of thinking being used. This putting on and taking off is essential. The hats must never be used to categorise individuals, even though their behaviour may seem to invite this. When done in groups, everybody wears the same hat at the same time.

White Hat thinking

This covers facts, figures, information needs and gaps. "I think we need some white hat thinking at this point..." means "Let's drop the arguments and proposals, and look at the data base."

Red Hat thinking

This covers intuition, feelings and emotions. The red hat allows the thinker to put forward an intuition without any need to justify it, e.g.: "Putting on my red hat, I think this is a terrible proposal." Usually, feelings and intuition can only be introduced into a discussion if they are supported by logic. Usually the feeling is genuine but the logic is spurious. The red hat allows a thinker to put forward his or her feelings on the subject at the moment.

Black Hat thinking

This is the hat of judgment and caution. It is a most valuable hat. It is not in any sense an inferior or negative hat. The black hat is used to point out why a suggestion does not fit the facts, the available experience, the system in use, or the policy that is being followed. The black hat must always be logical.

Yellow Hat thinking

This is the logical positive, giving advice on why something will work and why it will offer benefits. It can be used in looking forward to the results of some proposed action, but can also be used to find something of value in what has already happened.

Green Hat thinking

This is the hat of creativity, alternatives, proposals, what is interesting, provocations and changes.

Blue Hat thinking

This is the overview or process control hat. It looks not at the subject itself but at the "thinking" about the subject. "Putting on my blue hat, I feel we should do some more green hat thinking at this point." In technical terms, the blue hat is concerned with meta-cognition.

Creativity Techniques
Retrieved from the World Wide Web on 4 April, 2005:
http://www.mycoted.com/creativity/techniques/sixhats.php

Visual Brainstorming

When traditional thinking has become stale or dried up, visual brainstorming using graphic conceptualisation may be a useful alternative. This proceeds in two phases:

Idea Generation Phase: set a high target: e.g. to generate 20-30 basic idea-sketches on a specific problem in one hour. If students are working in groups, they could begin with private sketches which are then pooled, perhaps in a round robin session. Quick, impulsive ideas put into sketches can help to avoid undeveloped "lost" thoughts/ideas. Rapid response to an idea with an immediate sketch creates momentum, preventing any critical thought processes from intervening.

Evaluation Phase: The collection of sketched ideas can now be evaluated.

- Each student presents their idea-sketches, trying to observe them with as much openness as possible;

- The students should think of themselves as critics, looking at the sketches from different perspectives;

- Rotate the sketches, place images on images, cover top or bottom half, for example. These varying tactics may inspire yet another idea.

Teaching tips

- Comparison: Clustering all the sketches together, place complex ones with simplistic ones, make comparisons, etc. More ideas could be generated at this stage.

Creativity Techniques
Retrieved from the World Wide Web on 4 April, 2005:
http://www.mycoted.com/creativity/techniques/visbrain.php

Synectic Strategies

Synectics is the process of juxtaposing (mentally or physically) unlike, or dissimilar concepts, objects or experiences so that new understanding is reached – and something new is created. The process involves the construction of analogies or metaphors, i.e., one "thing" (a concept, an object or an experience) is set against another, dissimilar "thing", and expressed, either wholly or partially, in terms of that "thing." The synectic process is useful to help students unlock their creative potential. For example, you could ask them to choose and focus on a particular concept, object or experience and visualise the result if they:

- Took one or more of its important elements away;

- Added an entirely new element;

- Repeated one or more of its elements; or

- Synthesised the concept, object or experience into an entirely new context.

Checklist for monitoring creativity in your classroom

Use this checklist to evaluate the effect of your teaching and learning strategies and your classroom climate on students' creativity.

In my classroom, I…..			
	Rarely	**Sometimes**	**Often**
Provide problems that challenge and extend my students.			
Ask my students to think of a problem that needs solving and then get them to develop two or more possible solutions.			
Encourage "either-or" thinking.			
Encourage "what if?" thinking.			
Use group brainstorming to generate ideas.			
Give students plenty of time to think through problems.			
Ask students to evaluate solutions from a range of perspectives.			

Teaching tips

Include some specific criteria in assessment items that require them to give evidence of their creative, innovative approaches to the problem.			
Explain to students what the criteria actually mean and how they link to the learning objectives.			
Create a "safe haven" climate in which students feel comfortable to think out loud, and on their feet.			
Recognise and reward risk-taking.			
Provide regular, formative feedback on their ideas or creative work throughout the course.			

Some relevant material is available at:

Creativity: How is Your Climate for Innovation?
Retrieved from the World Wide Web on 4 April, 2005:
http://www.thinking.net/Creativity/creativity.html

Creativity Techniques:
Retrieved from the World Wide Web on 4 April, 2005:
http://www.mycoted.com/creativity/techniques/index.php

Ten Creativity Kick Starts:
Retrieved from the World Wide Web on 4 April, 2005:
http://members.optusnet.com.au/~charles57/Creative/Basics/kickstart.htm

Obstacles to Creativity:

Retrieved from the World Wide Web on 4 April, 2005:
http://members.optusnet.com.au/~charles57/Creative/Basics/obstacles.htm

Nightingale, P., Te Wiata, I., Toohey, S., Ryan, G., Hughes, C., & Magin, D. (1996). *Assessing Learning in Universities.* Sydney: University of New South Wales Press.

Checklist for monitoring students' creativity

You can help raise students' awareness of their own creative potential by asking them to complete a survey like this, and then discuss their responses in pairs or small groups.

Checklist
How do you go about creating something new (an idea, an object, a work of art, a performance, a process, etc.)?
a
b
c
d
e
What would you describe as your most original creative thought/idea/concept?
a
b
c
d
e
When you are creating something new, how do you know when you've arrived?
a
b
c
d
e
What conditions do you need to do your best creative work?
a
b
c
d
e
What kind of feedback is most helpful to you when you are working creatively?
a
b
c
d
c
What sort of environment best suits your ability to think creatively?
a
b
c
d
e

Phases in the creative process

The table below is drawn from Cropley's research into creativity (2001), and shows the creative processes, individual traits and motives in play during the various phases of developing something new. The table is not exhaustive; rather it is indicative of the wide range of forces at work during the creative process – it may be useful to share with your students to help them become aware of their own potential for creativity.

Phase	Process	Result	Motivation	Personality	Feelings
Preparation	Identifying problem; Setting goals; Convergent thinking.	Initial activity; General knowledge; Special knowledge.	Problem-solving drive (intrinsic); Hope of gain (extrinsic).	Critical attitude; Optimism.	Dissatisfaction.
Information	Perceiving; Learning; Remembering; Convergent thinking.	Focused special knowledge; Rich supply of cognitive elements.	Curiosity; Preference for complexity; Willingness to work hard; Hope of gain.	Knowledgeability; Willingness to judge and select.	Interest; Curiosity.
Incubation	Divergent thinking; Making associations; Bi-sociating; Building networks.	Configurations.	Freedom from constraints; Tolerance for ambiguity.	Relaxedness; Acceptance of fantasy; Non-conformity; Adventurousness.	Determination; Fascination.
Illumination	Recognising a promising new configuration.	Novel configuration.	Intuition; Reduction of tension.	Sensitivity; Openness; Flexibility.	Excitement.
Verification	Checking relevance and effectiveness of novel configuration.	Appropriate solution displaying relevance and effectiveness.	Desire for closure; Desire to achieve quality.	Hard-nosed sense of reality; Self-criticism.	Satisfaction; Pride in oneself.
Communication	Achieving closure; Gaining feedback.	Workable product capable of being made known to others.	Desire for recognition (intrinsic); Desire for acclaim or reward (extrinsic).	Self-confidence; Autonomy; Courage of one's convictions.	Anticipation; Hope; Fear.
Validation	Judging relevance and effectiveness.	Product acclaimed by relevant judge (e.g., teacher)	Desire for acclaim; Mastery drive.	Toughness; Flexibility.	Elation.

Cropley, A.J. (2001). *Creativity in Education and Learning: A Guide for Teachers and Educators.* London: Kogan Page, p. 73.

Teaching tips

CREATIVITY AND INNOVATION

Providing a safe environment for creativity

Creativity implies risk-taking. Risk-taking requires courage. Students must feel confident that their attempts to create something new and meaningful will not be laughed at, put down, or criticised too harshly. As lecturer or tutor, you need to provide a safe environment in which students will happily take risks and expose themselves to failure, by acknowledging that:

- taking risks is scary;

- they need to reflect on what they are creating, or solving;

- they need to document every stage of their process; and

- feedback from self and others can be invaluable.

Composers, choreographers, writers, designers and artists take risks every time they start creating a new work. To quote a visual arts student:

"You have a blank piece of paper on which you put marks, and every new blank piece of paper is potentially a new look discovery, a new disaster or a new success."

Candy, P.C., Crebert, G., & O'Leary, J. (1994). *Developing Lifelong Learners Through Undergraduate Education.* Commissioned Report No. 28. NBEET. Canberra: AGPS.

"In addition, each and every mark, or combination of marks one makes on a piece of paper may suggest or prompt another thought, another concept, and so on. This is a process of receiving visual feedback, thus magnifying the potential for a truly original and creative concept to emerge. In a sense, this is building 'visual capital.'"

Personal communication from: Barnes, P. (2005). Queensland College of Art, Griffith University.

Teaching tips

Assessing students' creativity

The main issues

Subjectivity

For most academics, the main issue in assessing students' creativity is subjectivity. How do you make an objective judgement about the worth of someone else's creative work, design, production, performance, idea, etc.? How do you put aside your own personal "taste," or likes and dislikes as they relate to a work of art, for example, while assessing a student's painting? Should you even try?

How do you decide whether you will assess the finished product or the creative process used to arrive at the finished product – or both? Which one of these represents the student's major "learning outcomes?" What is more important – the journey or the arrival?

As an assessor, your judgement and your ability to judge creative work develops over time, and with experience in the specific field.

Criteria

Closely linked to these dilemmas is the question of the criteria to use when assessing creative work. Each creative work, or evidence of creative thinking, performance, idea, etc., represents one person's (or a team's) response to a particular problem. All you can do, as assessor, is to measure the effectiveness of that creative work, performance, idea, etc. within certain parameters, i.e., against the criteria it aimed to meet. Setting valid and reliable criteria to use when assessing students' creativity, therefore, is absolutely crucial. These criteria need to include some that relate to the "fitness for purpose," of the work, idea or solution, to make your assessment more objective.

Judging how effective a product or response is in terms of its creativity and fitness for purpose depends, of course, on the conditions and requirements of the context in which it occurs.

"Genuine creativity requires a further element over and above mere novelty: a product or response must be relevant to the issue at stake and must offer some kind of genuine solution, i.e., it must be *effective*."

Cropley, A.J. (2001). *Creativity in Education and Learning: A Guide for Teachers and Educators.* London: Kogan Page p. 15.

Guidelines for assessing students' creativity

- **Offer students as wide a range of assessment options as possible**

Some students do well in essay or other written assignments; others excel under examination conditions; others like making things; performance is preferable for others, and so on. Wherever possible within the course constraints, offer students the choice of mode in which they are assessed.

For example, in Urban Analysis (2057EVP), a course in Environmental Planning at Griffith University, students are able to present their analysis of a creative work that provides a commentary of the urban environment, in the form of:

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- A film;

- A piece of music;

- A novel;

- A poem;

- A television episode; or

- A piece of artwork.

In another assessment item within the same course, students can opt for a photo-essay, a sound recording, a short story, a letter to the editor of a local newspaper, or a short film. In this way, most students engage with the course material and use the assessment to demonstrate their own creativity.

Another way to encourage creativity is to ask students to present *two* different methods of solving one problem. Alternatively, leave out an important piece of information from the problem you set the students. Ask them to find and identify the missing link and explain its significance in setting and framing the problem. You could even try presenting a problem with an *incorrect* solution, and ask the students to identify the cause and explain what is needed to rectify the difficulty.

"In engineering, creativity and innovation are often fostered by close working partnerships between the university, students, staff and employers. Visualisation, reformulating problems, solving problems framed by industry, and assessing students using a variety of different methods (e.g., filming students in action to foster reflectivity; holding small group discussions/debriefs after work placements; setting reflective essays; conducting group critiques, etc.), foster students' creativity."

Innovation and Creativity in the Curriculum
Retrieved from the World Wide Web on 4 April, 2005:
http://www.innovations.ac.uk/btg/resources/publications/innovation.pdf

- **Specify each aspect of creativity that will be assessed**

Ensure students know what you will be assessing. Some of the criteria for assessing creative work listed below were drawn from examples in Nightingale, *et al* (1996), others from Griffith University, and they come from a number of different discipline areas, including architecture, tourism and leisure studies, music and visual art. They include different kinds of criteria – for assessing "mastery of technical skills and the demonstration of creativity and artistic expression" (Nightingale, *et al*, 1996, p. 172):

Architecture	Functional response to brief; use of site; evidence of framework of ideas; design concept development; quality of design; integration of structure; cost control; engineering product design; design methods; ergononomic analysis; economic analysis; aesthetic analysis; design communication; research and analysis; interpreting the project brief; understanding market needs; problem analysis; creative and imaginative development; concept generation; concept development; critical and decision making skills; professional and executive abilities; technological understanding; project management; ability to apply engineering theory; oral presentation skills.

Assessing students' creativity

Music	Technical proficiency (articulation; tonal quality; accuracy; agility; posture; memorisation; intonation; diction – if applicable); musicianship (sense of style; use of colour; phrasing; line; dynamic differentiation; rhythm; tonal balance; improvisation – if applicable); musical character/temperament (sense of individual personality; interpretive qualities; ability to communicate emotion; sense of involvement; personal presentation); overall impact.
Visual art: 2340QCA: Interdisciplinary Art Practice (Painting) at Queensland College of Art, Griffith University	<u>Aesthetic Achievement</u> as evidenced by: pictorial organisation; composition and structure; expressive content; formal resolution. <u>Conceptual Achievement</u> as evidenced by: contextual relevance; development of resources; development of ideas; communication of intention; innovation and originality. <u>Technical Achievement</u> as evidenced by: media skills; knowledge of relevant processes; handling of materials and equipment; curatorial knowledge and presentation. <u>Studio Performance</u> as evidenced by: effective time management; regular consultation with teaching staff; completion of folio requirements by due dates; responsible and safe studio practice; consistent participation in studio activities, tutorials and critiques.
Design: 2545QCA: Creative Thinking	<u>Seminar presentation:</u> Level of risk evidenced in presentation; demonstrated creativity/innovation; a written rationale; and audience participation. <u>Creative product:</u> Demonstrated creativity/innovation; practicality (Can it work?); overall visual impact (Gestalt qualities); and written rationale and research.
Tourism Studies: 2108HSL: Tourism Studies	<u>Exercise/Activity:</u> Synthesise theoretical and practical knowledge about tourist behaviours to analyse existing leisure travel products and design a modified or new product (eg. Fishing tour; bed and breakfast stay; children's holiday programme). <u>Creativity and innovation for this assessment item is defined as:</u> ▪ designing or modifying new products through synthesis and analysis of data on product ▪ by understanding previous and current practices, synthesising this experience and knowledge, and placing that information into its new context represents creative and innovative endeavour ▪ data collation, analysis and subsequent design justifies argument for new product <u>Outcome:</u> measurable improvement of product

▪ **Allow enough time to assess the creative elements in each assignment**

Assessing creativity is hard work and time consuming. Students need a lot of formative feedback along the way, so you cannot rely on a final, end-of-project summative assessment on which to award grades. It can often be difficult to assess creative work objectively. Often, your own preferences and taste need to be put aside and the work

viewed as a whole, on its own merit, but just as often these preferences and tastes emerge only after vast professional experience – hence the 'Gestalt' qualities assessed in design assignments (for instance, examine how the professional/academic sees the work against the backdrop of the field or domain, and its contemporary setting. Whatever the field or discipline, however, if your original criteria were valid and aligned to the learning objectives, your task will be easier.

- **Let students know the criteria**

Students need to know and understand the context in which they are asked to be creative, and to understand the assessment criteria for each assignment. You may want to involve them in setting all or some of the criteria so they understand more fully. Ask students to hand in the criteria sheet with their assignment, and to indicate how they would assess themselves against each of the criteria.

- **Show students how their expectations and your expectations align**

Debriefing after assessment of a creative work is a very important stage in the creative process. Students need to know how and why you awarded a particular grade or mark. They need to understand the standards that you expected them to reach. They will face criticism, and even rejection, of their creative ideas or works once they graduate, so the kind of feedback you give them at university is critical in preparing them for this.

Peer review or critique of creative work

Why not:

Do what many of the visual and performing arts, design, engineering and architectural disciplines do: run "analytical appraisals," in which all students get the chance to give feedback on their peers' (and their own) work. You, as lecturer or tutor, can give your own evaluation (and justification for it), and answer their questions. Time constraints mean that feedback has to be succinct, but meaningful.

Alternatively, devote at least one tutorial session to peer review and ask students to bring their "work-in-progress." Ask pairs or small groups of students to give constructive, formative feedback against each of the assessment criteria, using clear guidelines for the peer review process.

Circulate or display examples of student work from the high, middle and low ranges of grades or marks, to illustrate strengths and weaknesses in creative project work or assignments.

Benefits of peer review

Benefits to students of peer review of creative work	
Better learning outcomes through opportunities to improve drafts or works in progress before submission or completion	The questions and comments from peers can challenge students to rethink or reconceptualise.
A sense of a wider audience	By sharing their work-in-progress with their peers, students are exposed to a wider audience than their lecturer or tutor.
Practice in giving and receiving criticism	Listening to others' opinions, answering their questions, justifying their own rationale and ideas, and doing the same for other students, improves communication skills, critical evaluation and analytical skills, and prepares students for the real world.
Enhanced communication skills	Talking with peers about their creative work can strengthen students' ability to say what they think, while maintaining the balance between criticism and tact.
Increased confidence	Students frequently believe their peers' work is much better than their own. Being able to see what their peers are working on, or what they have submitted for assessment, shows them that it is safe to loosen up and take risks in developing their own ideas.

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Benefits of peer review to lecturers and tutors	
Higher standards in work submitted for assessment	The flow-on effect of peer review is tangible, and shows in the quality of creative work submitted for assessment. Students are more likely than otherwise to revisit or rethink their own work before assessment when it has been critiqued by their peers. Peer review may even reduce marking time.
Higher levels of student engagement	Inevitably, there is some anxiety and nervousness about showing creative work to an audience of peers. The associated adrenalin rush can result in higher levels of student engagement during peer review or critique sessions than in a regular tutorial session.
Higher evaluation ratings	Students tend to rate peer review sessions highly (not in itself a justification for its use!).

Adapted from:
Creating Effective Peer-Response Workshops. University of Minnesota.
Retrieved from the World Wide Web on 4 April, 2005:
http://writing.umn.edu/tww/responding_grading/peer_workshop.htm

Portfolios

Many of the disciplines that assess students' creativity and innovation use portfolios (hard copy or digital), either at point of entry (as "gatekeeping" mechanism) or at the end of final year (as evidence of the quality of their work). Portfolios are collections of evidence of student achievement in their "best" work, accompanied by reflective learning documents. Portfolios are usually assessed by a panel of academic staff, sometimes in conjunction with external assessors from the field. In some fields, students are required to defend or advocate their work to the panel, in preparation for their future careers. They are given practice during their course in advocating during simulated panel, or jury sessions.

In law, where much student assessment is through assignments or examinations, student portfolios are now recognised for their potential to:

- provide evidence of a wider range of personal and intellectual abilities and skills than most conventional forms of assessment;

- support the integration of learning from different parts of a program;

- achieve a close integration of learning and assessment, particularly in work-based, clinical or problem-based learning;

- prove harder to plagiarise than more conventional coursework assessments;

- provide evidence of "employability" by showing employers what students can do, as well as what they know.

Adapted from: Portfolio-based learning and assessment in law
Retrieved from the World Wide Web on 4 April, 2005:
http://www.ukcle.ac.uk/resources/portfolios.html

Assessing students' creativity

Principles

To be creative and innovative:

Always:

- Be sensitive to problems;

- Avoid being strangled by accumulated knowledge;

- Approach the new without fear;

- Consciously seek to accommodate new experiences;

- Be willing to revert to the status of beginner or novice;

- Consciously look for the inadequacies in what you know and can do;

- Have trust in yourself;

- Accept your weaknesses and do not regard revealing them as a sign of incompetence.

Adapted from:
Cropley, A.J. (2001). *Creativity in Education and Learning: A Guide for Teachers and Educators.* London: Kogan Page, p. 95.

Students' confidence in their creative skills develops if they are given opportunities to:

- understand the role of creativity in their own lives and in their work after graduation;

- use a variety of media and formats in which to express themselves, or be assessed;

- share ideas and learn from experts in a number of different fields, and across different cultures, roles or jobs about their understanding of what makes something (an idea, a work, a product, a process) "creative";

- self-evaluate their work in a structured manner against the assessment criteria; and

- receive comprehensive feedback on their work before and after submitting assignments.

Providing a safe learning environment for risk-taking involves

- Raising students' awareness of their own and others' creative processes;

- Preparing them for the possibility of failure;

- Providing clear guidelines about giving and receiving feedback;

- Giving students plenty of practice in presenting and defending their work.;

- Recognising and rewarding risk-taking.

When assessing students' creativity

- Make sure the assessment criteria align with the learning objectives;

- Give students the assessment criteria in advance and explain what they mean;

Principles of effective creativity and innovation

CREATIVITY AND INNOVATION

- Incorporate peer- and self-review into the assessment process to improve standards and learning outcomes;

- Assess the work in terms of the learning objectives and specified criteria, rather than on the basis of your own preferences and biases.

Where to go for help

Contact

The Griffith Graduate Project (Stage 6)

Dr Gay Crebert
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Griffith University
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Learning Services

Being creative and innovative are areas where the University has recognised that support is crucial. Learning Services has teams of **learning advisers** here to work with you. They can:

- advise you on teaching, learning and assessment strategies; and

- team teach with you in your lectures and tutorials.

There are also services to which you can refer your students so that they can independently develop their creative and innovative skills. These include:

- individual or small group consultations with a learning adviser;

- workshops;

- self-help resources.

For more information on these services, visit:
http://www.griffith.edu.au/ins/training/

Library

Faculty Librarian Team Leaders

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Additional resources

This Toolkit draws on various print and web resources, which are acknowledged in text. Other useful resources are included in the following list.

Print resources

Adams, J.L. (1986). *Conceptual Blockbusting: A Guide to Better Ideas.* Harmondsworth: Penguin.

Buzan, T., & Buzan, B. (2000). *The Mind Map Book.* London: BBC.

Edwards, B. (1989). *Drawing on the Right Side of the Brain.* Los Angeles: Jeremy Tarcher, Inc.

Florida, R. (2002). *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life.* New York: Basic Books.

Florida, R. (forthcoming). *The Flight of the Creative Class: The New Global Competition for Talent.*

Gardner, H. (1982). *Art, Mind and Brain: A Cognitive Approach to Creativity.* New York: Basic Books.

Gardner, H. (1993). *Creating Minds: An Anatomy of Creativity Seen Through the Lives of Freud, Einstein, Picasso, Stravinsky, Eliot, Graham, and Ghandi.* New York: Basic Books.

Gregory, R. (Ed.). (1987). *Creative Intelligences.* London: Frances Pinter.

Rourkes, N. (1988). *Design Synectics: Stimulating Creativity in Design.* Worcester, Mass.: Design Publications.

Von Oech, R. (1983). *A Whack on the Side of the Head: How to Unlock Your Mind for Innovation.* New York: Warner Book.s.

Von Oech, R. (1986). *A Kick in the Seat of the Pants: Using Your Explorer, Artist, Judge and Warrior to be More Creative.* New York: Harper & Row.

Web resources

Creativity in Science and Engineering (Ronald B. Standler):
Retrieved from the World Wide Web on 4 April, 2005:
http://www.rbs0.com/create.htm

Creativity Techniques:
Retrieved from the World Wide Web on 4 April, 2005
http://www.mycoted.com/creativity/techniques/index.php

Introduction to Creative Thinking:
Retrieved from the World Wide Web on 4 April, 2005:
http://www.virtualsalt.com/crebook1.htm

Additional resources

CREATIVITY AND INNOVATION

10 Creativity Kick Starts:
Retrieved from the World Wide Web on 4 April, 2005:
http://members.optusnet.com.au/~charles57/Creative/Basics/kickstart.htm

Synectics: A Brainstorming Tool:
Retrieved from the World Wide Web on 4 April, 2005:
http://edweb.sdsu.edu/Courses/ET650_OnLine/MAPPS/Synectics.html

Tepper, S.   The Creative Campus: Who's No. 1?. *The Chronicle of Higher Education,*
10/01/04. Retrieved from the World Wide Web on 4 April, 2005 from
http://www.americanassembly.org/programs.dir/prog_display_ind_pg.php?this_filename
_prefix=CCAMPUS&this_ind_prog_pg_filename=press

Tutorial on creativity, brainstorming and innovation:
Retrieved from the World Wide Web on 8 March, 2005
http://www.infinn.com/creative.html

Additional resources

Student handouts

A collection of ready to use resources associated with being creative and innovative.

- What employers, graduates and students say about being creative and innovative;
- Checklist for monitoring your own creativity;
- Phases in the creative process;
- Principles.

Student handouts

What employers, graduates and students say about being creative and innovative

Employers' comments

"Being creative is like playing with fire. You need it to stay alive and be outstanding against your competitors, but you have to use it carefully if you don't want to get burned."
(Employer of Griffith Graduates, 2005)

"Creativity is a configuration of the brain which allows the lucky ones to think outside the square and view things in colour. The creative elements add to life its spice and make society a more interesting place to live. Our industry [photography] exists because it has the ability to supply this vital ingredient. It extends our society's conceptual framework, and enriches its cultural content. It is therefore crucial that people with such gifts are concentrated and helped to generate this essence of novelty and discovery. Society, as with snakes, shed their cultural skins from time to time. Creative industries are there to make sure that the new skin is all the more colourful."
(Employer of Griffith Graduates, 2005)

"…and innovation as well – that's a very broad term, and it's not just about inventing things. It's about looking at processes and information flow and communication flow, and making suggestions and being aware of how processes work, and how business works, and assessing and researching it for yourself. That brings value to the organisation, which in turn will hve an enormous flow-on to your own career."
(Employer of Griffith Graduates, Careers Fair, 2004)

"[We look for graduates who can] see opportunities. I wouldn't say weaknesses, but opportunities in the business. It's important in our game to stay on top, otherwise we'll get left behind and our market share will diminish, putting our company at risk."
(Employer of Griffith Graduates, Careers Fair, 2004)

"[To engineers, it seems as if the universities use] 'a + b = c – that's the rule' [as a model], and if you put 'd' you are wrong. But in the real world, it doesn't happen like that, because the weather was dark, and therefore the answer was 'b'. You just can't tell. I think that university students come out with [the idea that] 'There is only one answer, and it has to be y,' and they get 100% if they get the right answer, but the real world doesn't work like that. The real world is very much like, 'Which way was the wind blowing?' Stuff happens."
(Employer of Griffith Microelectronic Engineers, 2002)

Graduates' comments

"Being creative can seem a bit risky, but it always adds interest, rarely hurts you, and can give you great rewards if you are willing to follow through with hard work."
(Griffith Graduate, 2005)

"Creativity is the basis of problem solving, which is an important characteristic for the work-ready graduate. To effectively solve problems, you need to consider not only the issues underlying the problem and solutions that others have found, but also to consider quite new strategies – the development of which relies on creative thought."
(Griffith Graduate, 2005)

"Creativity powers change, which is an important consideration in an increasingly competitive and technologically complex marketplace. Creativity can provide a solution to

a problem; new ideas; the flexibility to see/accept different perspectives; and original and imaginative products and services."
(Griffith Graduate, 2005)

Students' comments

"Creativity in business is simply using one's initiative and taking risks to gain a competitive advantage. It involves thinking outside the square to stimulate new ideas and creations to better a business/product/service. Creativity should be present in every aspect of a business, from the features and benefits of a product/service to the general day-to-day motions of a business to keep up with ever-changing and competitive markets. Creativity is a vital ingredient of a successful business."
(Griffith Student, 2005)

"Creativity is important in my field (engineering), because there is often more than one solution to a problem. Creativity helps explore different options for a solution."
(Griffith Student, 2005)

Student handout—Employers, graduates and students

Checklist for monitoring creativity

Complete this questionnaire, and then discuss your own creative potential with others.

Checklist
How do you go about creating something new (an idea, an object, a work of art, a performance, a process, etc.)?
a
b
c
d
e
What would you describe as your most original creative thought/idea/concept?
a
b
c
d
e
When you are creating something new, how do you know when you've arrived?
a
b
c
d
e
What conditions do you need to do your best creative work?
a
b
c
d
e
What kind of feedback is most helpful to you when you are working creatively?
a
b
c
d
c
What sort of environment best suits your ability to think creatively?
a
b
c
d
e

CREATIVITY AND INNOVATION

Phases in the creative process

The table below is drawn from A.J. Cropley's research into creativity (2001), and shows the creative processes, individual traits and motives in play during the various phases of developing something new. The table is not exhaustive; rather, it is indicative of the wide range of forces at work during the creative process.

Phase	Process	Result	Motivation	Personality	Feelings
Preparation	Identifying problem; Setting goals; Convergent thinking.	Initial activity; General knowledge; Special knowledge.	Problem-solving drive (intrinsic); Hope of gain (extrinsic).	Critical attitude; Optimism.	Dissatisfaction.
Information	Perceiving; Learning; Remembering; Convergent thinking.	Focused special knowledge; Rich supply of cognitive elements.	Curiosity; Preference for complexity; Willingness to work hard; Hope of gain.	Knowledgeability; Willingness to judge and select.	Interest; Curiosity.
Incubation	Divergent thinking; Making associations; Bi-sociating; Building networks.	Configurations.	Freedom from constraints; Tolerance for ambiguity.	Relaxedness; Acceptance of fantasy; Non-conformity; Adventurousness.	Determination; Fascination.
Illumination	Recognising a promising new configuration.	Novel configuration.	Intuition; Reduction of tension.	Sensitivity; Openness; Flexibility.	Excitement.
Verification	Checking relevance and effectiveness of novel configuration.	Appropriate solution displaying relevance and effectiveness.	Desire for closure; Desire to achieve quality.	Hard-nosed sense of reality; Self-criticism.	Satisfaction; Pride in oneself.
Communication	Achieving closure; Gaining feedback.	Workable product capable of being made known to others.	Desire for recognition (intrinsic); Desire for acclaim or reward (extrinsic).	Self-confidence; Autonomy; Courage of one's convictions.	Anticipation; Hope; Fear.
Validation	Judging relevance and effectiveness.	Product acclaimed by relevant judge (e.g., teacher)	Desire for acclaim; Mastery drive.	Toughness; Flexibility.	Elation.

Cropley, A.J. (2001). *Creativity in Education and Learning: A Guide for Teachers and Educators.* London: Kogan Page, p. 73.

Student Handout – Checklist for monitoring creativity

Principles

To be creative and innovative:

Always:

- Be sensitive to problems;

- Avoid being strangled by accumulated knowledge;

- Approach the new without fear;

- Consciously seek to accommodate new experiences;

- Be willing to revert to the status of beginner or novice;

- Consciously look for the inadequacies in what you know and can do;

- Have trust in yourself;

- Accept your weaknesses and do not regard revealing them as a sign of incompetence.

Adapted from:
Cropley, A.J. (2001). *Creativity in Education and Learning: A Guide for Teachers and Educators.* London: Kogan Page, p. 95.

Confidence in your creative skills develops if you make opportunities to:

- understand the role of creativity in your own life and in work after graduation;

- use a variety of media and formats in which to express yourself;

- share ideas and learn from experts in a number of different fields, and across different cultures, roles or jobs about their understanding of what makes something (an idea, a work, a product, a process) "creative";

- self-evaluate your work in a structured manner against the assessment criteria; and

- seek comprehensive feedback on your work before and after submitting assignments.

A safe learning environment for risk-taking involves

- Being aware of your own and others' creative processes;

- Being prepared for the possibility of failure;

- Following and using clear guidelines about giving and receiving feedback;

- Getting plenty of practice in presenting and defending your work.;

- Taking risks.

CREATIVITY AND INNOVATION

When doing an assessment item that requires creativity

- Check that the assessment criteria align with the learning objectives;

- Ensure you understand the assessment criteria and know what is expected of you;

- Get feedback from your peers and do some self-review of your creative work;

- Be very critical of your own work – try to evaluate it from a range of different perspectives.