

Please bring this handout with you to the workshop

Smaakmaker XXL: Working together on knowledge development

Knowledge development through integrating research and education in professional and community contexts

Amsterdam University of Applied Sciences

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“We are all researchers now ... Teaching and research are becoming ever more intimately related ... In a ‘knowledge society’ all students – certainly all graduates – have to be researchers. Not only are they engaged in the production of knowledge; they must also be educated to cope with the risks and uncertainties generated by the advance of science.” (Scott 2002, 13)

Afternoon Program

13.15 - *Integrating research and education to develop professional knowledge*

This session will present some conceptual frameworks and a large number of mini-case studies to stimulate ideas

14.00 - *Generating ideas*

In this session you will work with colleagues in your team (or with a related team) to generate and prioritise ideas on how best to integrating research and education to develop professional knowledge in your context

14.45 - *Designing your project* - Refreshments will be available during this session

During this session you will work in your teams to flesh out the details of your project – possibly revised or rethought in response to the previous two sessions. Among the topics you will specify for your project, where appropriate, are the title, leader(s), department/institution, aim(s), rationale and evidence of need (e.g. from literature), timescale, participants/stakeholders, methods/programme, outputs (e.g. learning resources, publications, workshops), outcomes (i.e. what do you expect to be different in terms of stakeholder behaviour as a result of project), and evaluation/evidence of impact plan. See *project planning template at the end of this handout*.

15.25 - *Poster creation and parade*

Each team will have 10 mins to create a poster summarising the main features of their project on ONE flip chart sheet which should be displayed on the wall using ‘poster buddies’ by 15.40 at the latest.

One member of your team should stand by your poster to answer questions while the others should circulate and comment on at least 6 other posters. You will each have some post-its to write your comments on and attach to the posters. You may agree to swap the person standing by the poster half-way through.

16.15 - *Reflection on the day* - Jean Tillie

16.30 - *Drinks and continuation of poster parade*

You may wish to take a picture of your poster and comments before you leave

A. Context and frameworks

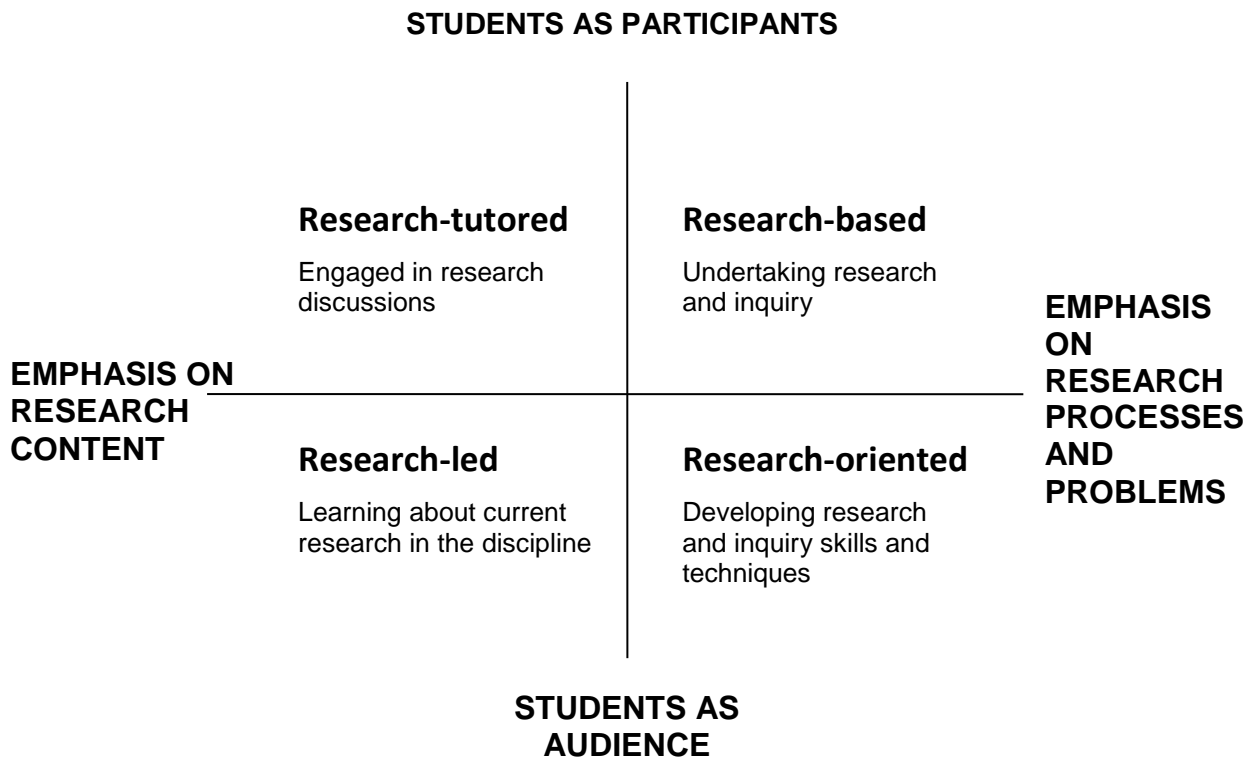
“For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidence, take decisions on a rational basis, and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.” (Brew 2007, 7)

A Hybrid Learning Community “can be characterized as a learning environment at the interface between school and workplace in which students from different study programs work on ill-defined, authentic tasks or issues in professional practice or the community.” (Cremers et al. 2016)

Table 1. Learning configurations

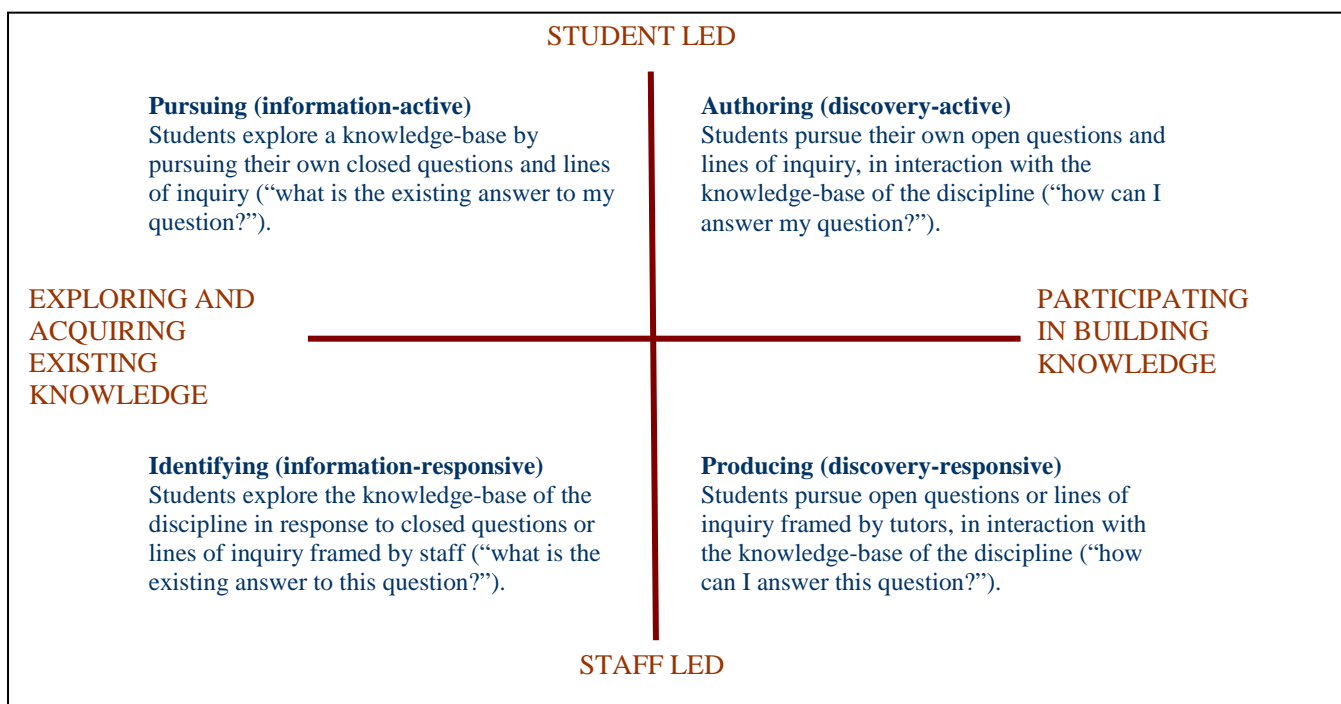
Form	Linkages between	Titles
Duos	Research and Education	Research-based education (RBE); Research-based learning (RBL)
	Work and Education	Work integrated learning (WIL); Work-based learning (WBL)
	Community and Education	Community-based learning (WBL)
Trios	Research, Work and Education	Professional Learning Environments (PLEs)
	Research, Community and Education	Community Learning Environments (CLEs)
Quads	Research, Work, Community and Education	Professional and Community Learning Environments (PCLs)

Fig 1. Curriculum design and the research-teaching nexus



Source: Healey and Jenkins (2009, 7), based on Healey (2005, 70)

Fig 2 Inquiry-based learning: a conceptual framework



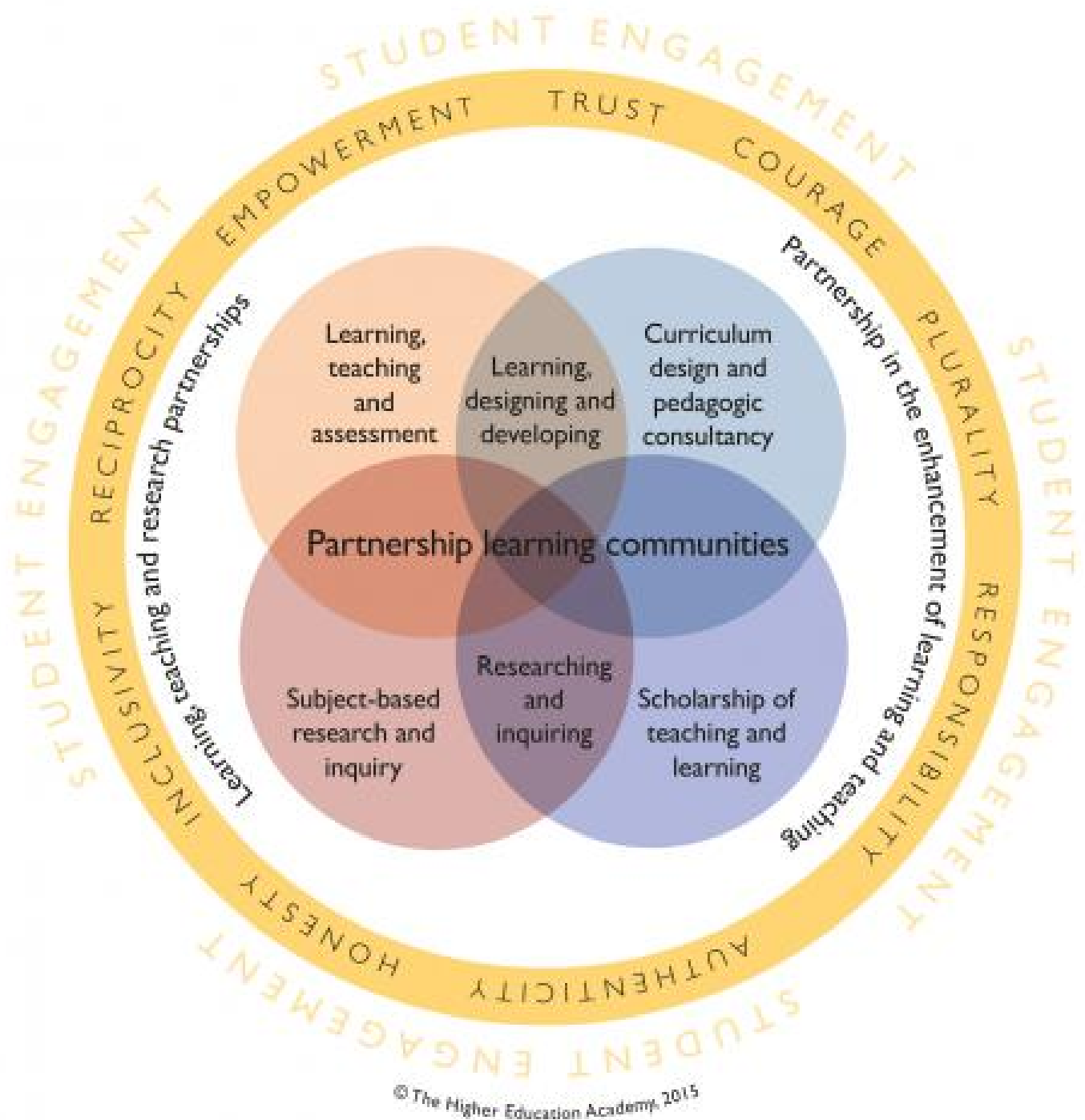
Based on Levy (2009)

Table 2: The design of a 30-credit course for knowledge workers at Hanze UAS

Design Principle	Features of the Course
Fostering Authenticity	Learning is driven by questions or problems in society. Students apply methods such as design thinking to find answers in the form of knowledge and products. Students initiate their own projects, engage stakeholders in the community, and field-test prototypes of their solutions to problems in practice.
Interlinking of Working and Learning	Students learn by doing, discovering, and making mistakes. Lecturers act mainly as facilitator or coach. Educational interventions include coaching during project work, peer feedback, and feedback from experts and lecturers. Lecturers occasionally provide workshops on topics such as self-directed learning and design thinking. Students organize workshops for each other on study materials related to student-framed inquiry and invite experts to give lectures or workshops. Lecturers assess the students’ work, focusing mainly on the processes (design thinking, self-directed learning) and less on the specific outcomes.
Utilizing Diversity	Students work alone or in small teams (the latter is encouraged) consisting of students enrolled in different study programs. Students are encouraged to form networks of peers and professionals involved in their topic of investigation.
Facilitating Reflexivity	Students learn to set their own learning goals, monitor their learning, and make their learning results explicit. Students write weekly logs in which they reflect on critical events that provided learning opportunities. Students offer each other feedback on their self-directed learning activities in peer groups that are initially facilitated by a lecturer but are increasingly run by the students. Students write learning reports twice during the course and present their personal learning outcomes to each other and the lecturers.
Creating a Learning Community	Students provide peer feedback and support each other in their project work. Students create their own culture and set of rules that reflects a professional working culture and a sense of community. Lecturers are also learners and solicit feedback from each other and students.
Enabling Organization	Students have their own working space that they are allowed to decorate themselves.
Enabling Ecology	Enrollment in the course is preceded by an interview to foster commitment and manage expectations. Students form their own networks with stakeholders and experts on their topic. Lecturers often act as “brokers,” helping students find relevant experts inside or outside the university.

Source: Cremers (2017, 42) <https://www.cur.org/assets/1/23/CURSpr17internationalesk.pdf>

Fig 3: Students and staff as partners in learning and teaching in higher education: An overview model



Source: Higher Education Academy (2015) Based on: Healey, M., Flint, A. and Harrington, K. (2014) *Engagement through partnership: students as partners in learning and teaching in higher education*. York: Higher Education Academy p.25. <https://www.heacademy.ac.uk/engagement-through-partnership-students-partners-learning-and-teaching-higher-education>

B. Case studies of knowledge development in professional and community contexts

These case studies are drawn from two wider sets of case studies on 'research-based curricula in college-based higher education' and 'linking research and teaching through engaging students in research and inquiry' available from my website www.mickhealey.co.uk under resources.

1. Art and Design

1.1 Integration of research-based learning with professional practice in the Art and Design (Foundation) Diploma (FdA) at Kingston College, UK

A. Through industry links

A crucial aspect of the FdA one year Diploma in Art & Design is the necessary skill development to meet the demands of being a professional practitioner through live projects and industry experience. The interdisciplinary live project involves students conducting independent visual research into the commercial viability of their art & design practice, in order to produce a series of well-crafted products for a pop-up shop within the Bentalls Department Store in Kingston upon Thames. Research includes customer profiles, production lead-time, skills analysis and material costing, packaging and sale presentation. From inception, the project is externally focused, with client feedback from Bentalls on pricing, advertising strategies and point of sale organisation. Students need to synthesise and act on this information in order to produce a range of products that clearly demonstrate how visually orientated research meets the needs and demands of the client.

Hence students are provided with the opportunity for students to gain real world experience, and to explore ideas within a public realm. Moreover it helps the students prepare for year two, in which they are required to explore external links more independently.

B. Through community links

Research-orientated professional practice and skill development is also supported on the FdA Diploma in Art & Design through community links, including a collaborative project with Burlington Junior School in New Malden. This involves year one students gaining valuable teaching experience through running painting and drawing workshops alongside professional teachers. Research undertaken prior to delivery includes a skills analysis of the age group, national curriculum requirements (focussing on cognitive and creative development) and the implications of teaching a widely differentiated student group.

Sources: Correspondence with Rob Miller (rob.miller@kingston-college.ac.uk) and Deborah James (deborah.james@Kingston-College.ac.uk); <http://www.kingston.ac.uk/undergraduate-course/art-design-foundation-diploma-2013/>

1.2 Giving students alternative assessment options for undertaking a product design project at Nottingham Trent University, UK

The course offers several possible routes. Assessment is based on a learning contract negotiated and agreed between the tutors and student. This contract stipulates the content of work, enabling students to complete one of the following options:

1. a 10,000-word dissertation and students produce a poster that summarises their work;
2. a 5,000-word conference paper with a supporting presentation delivered to peers and tutors;
3. a conceptual project with a 5,000-word critical justification. As well as a written outcome students are required to produce illustrations or simulations.

Prior to students undertaking their chosen assignment, there is a three-week intensive period when students complete a learning contract. The contract identifies what option the student will complete, what they hope to learn and how that learning will be demonstrated. The module involves students using a wide range of primary and secondary research skills.

1.3 Community Project Work in Architecture and Built Environment at the University of New South Wales, Australia

In 2007 the Architecture programme trialled an outreach program/course that engaged upper level students in community-oriented research and learning. In 2013 2011 the FBE**OutTHERE!**, course offerings became an integral aspect of a faculty interdisciplinary learning initiative which Year 3 students are required to undertake. Shaped by the needs of community partners the Faculty define a range of projects for student teams. The projects are clearly interdisciplinary and have both a research and a design phase. For example, a local housing project required students to learn how to research traffic flows, pedestrian behaviour and how community groups saw these issues and then propose designs to better manage traffic and better ensure community involvement. Students then presented their findings to community groups.

Sources: <http://trnexus.edu.au/uploads/examples%20June%2003/Architecture%201.pdf>
<http://www.be.unsw.edu.au/content/built-environment-interdisciplinary-learning-initiative-beil>
<http://www.be.unsw.edu.au/community/beoutthere>; <http://www.be.unsw.edu.au/content/built-environment-interdisciplinary-learning-initiative-beil>; Corkery and Quinlan (2011); Quinlan (2004); Quinlan *et al* (2003; 2008).

1.4 Developing Authentic Undergraduate Research in Art & Design at Nottingham Trent University, UK

The Critical Practices Modules occur throughout the students' undergraduate degree in years 1, 2 and 3. The process of teaching in Years 1 and 2 develops this focus on research, and also on collaborative learning. The modules focus on critical and contextual thought and practice in the context of an undergraduate design programme. The teaching starts from the presupposition that the research process as an inquiry should have primacy, and that the modes of development and exposition should be "authentic" to the research context. Authentic in the context of a creative art & design programme is therefore understood to include creative art & design practice itself. Student research is as likely to be situated in the context of developing creativity in the context of a Primary School, or practically applying Bakhtin's notion of carnival to flashmobs, as it might be focused on deconstructing Wagnerian Stenography, or analysing the visual language of Jacobean play texts. The final year Major Research Project has been revalidated to replace a written dissertation with a three part structure:

- A "research document" which can be in any form relevant to the research. This can include the traditionally written dissertation, but has also included video, animations, documented performances, artefacts and business plans. These are usually integrated within written texts.
- An abstract of 750 – 1500 words which articulates the fundamental aspects of the research project (research question, methodology, findings, and conclusions). The abstract effectively makes the claim for the research project and cross references the evidence in the research document.
- A seminar presentation which frames the research for a live audience, where the student responds to questions which arise from the research.

2. Business, Hospitality, Sport and Tourism

2.1 Linking first and second year assessment strategies through researching the need for a local sports development project in a work based learning module at West Herts College, UK

In the second semester of the first year (level 4) Foundation Degree in Sport Studies (FDSS) learners at West Herts College, an average of N=16 (2009-2013) students study a Sports Development module. One assessment method within this module involves researching the need for a local sports development project. Students complete a project proposal form which is then presented to a panel for assessment. This enables students to complete research based inquiry into the physical activity and coaching needs of the local community. In addition to meeting learning outcomes specific to Sports Development, cross module links with Sports Coaching and Study Skills modules are also embedded through the completion of this assessment activity.

In year 2 (level 5), students are encouraged to approach employers with their first year Sports Development project proposals, to fulfil the requirements of their double semester work-based learning (WBL) module. On average seven out of ten students use this opportunity with others seeking projects linked with marketing and management. Within WBL, students are required to network with employers to find a niche in the employers' market. Students develop, implement, analyse and reflect on their implemented project proposals and this forms the basis for a 5,000

word mini final project / dissertation. In addition students are also required to support each other in an online learning community through use of Blogs and Wiki's throughout their project delivery, enabling them to maintain contact with each other and with teaching staff.

The nature of the inquiry based project in the first year enables learners to thoroughly research and investigate their potential projects prior to implementation in the second year, clearly showing study progression and academic skill development. Examples include: a proposal to increase female sports participation which resulted in a cricket enrichment programme at a local secondary school for year 8 females pupils and an employment opportunity for the FDSS student; a proposal to increase Sikh community sports opportunities which resulted in a varied sports enrichment programme at a local primary school within a Sikh community and established school-club links within the local area. The FDSS student involved in this later project was offered employment at the primary school and at the leisure centre at which a number of the school-club links were cemented.

Source: Correspondence with Charlotte Gale (Charlotte.Gale@westherts.ac.uk)

2.2 Students on the Foundation Degree Business Management and Enterprise undertake a management consultancy project at Sheffield College, UK

The management consultancy project is designed for second year (level 5) students to pull together the skills and knowledge they have gained during their time at the College by investigating an area of their own business or one that they work for. The students are given the role of external consultants who can look at the business objectively, while still using their contextual understanding to suggest a complex action plan for improvements on a particular area of the business. This topic area is decided on through a negotiation with course staff and the student's manager/business need. The choice made depends on student and tutor expertise as well business objectives. Examples include: 'Investigating the ways for Strawberry Student Homes to attract more students and increase letting of accommodation'; and 'An investigation into possible investment options to expand current customer base at Clobber Print'.

The module is delivered predominantly online with regular opportunities for formal, individual, formative feedback planned into the sessions. Students are encouraged to be independent learners and to personalise their own learning. This means group sessions are not always useful as learners have different content/knowledge needs as well as different contexts in which they work. Students can choose the most appropriate method to share their findings. They are given the option of a YouTube video, a seminar, Q&A session or anything else they think is 'appropriate'. So far all have chosen 15-20 min PowerPoint presentations. It is not required that the students implement their findings but the impact of their application must be assessed. The unit is vocationally focused rather than academically driven, although there should be examples of academic good practise employed. This means that the expectations are that the findings should be useful and should have been clearly justified within the business context.

Source: Correspondence with Joan Rudder (Joan.Rudder@sheffcol.ac.uk) and Alice Bailey (Alice.Bailey@sheffcol.ac.uk)

2.3 Marketing final year research project at Letterkenny Institute of Technology, Ireland

All students taking the Bachelor of Business (Honours) Marketing complete a major marketing research project as a partial requirement for the fulfilment of their BBS Honours Marketing. The Marketing Research Project (5 credits) module is the capstone marketing research module. Prior to this, all students complete two modules (equating to 10 credits) specifically related to the field and practice of marketing research. These modules are called Marketing Research Methods and Applied Marketing Research.

In the research capstone module learners must work in groups and source a business that has a research problem or opportunity that they can address. For example one group of learners recently worked with an established hotel in the locality to investigate the consumer decision-making process for the selection of a wedding venue in Co. Donegal. The methodology for this project included a focus group with five couples who were married recently in Co. Donegal and a structured survey (N = 100). Learners are required to apply the principles of best practice marketing research throughout their project. They are required to design and justify a sound methodology, and execute that methodology, incorporating innovative marketing research techniques throughout. Learners present a copy of their

research projects to the business. Learners are also required to maintain a personal log, detailing their individual research reflections, throughout the module.

The Marketing Research Project module (semester 8) is linked to a preceding module, Applied Marketing Research (semester 7). In this module, the continuous assessment requires learners to source a business that has a research problem or opportunity and design a suitable marketing research proposal to address that research opportunity. In the semester 8 Marketing Research Project module, learners revise the proposal and execute the proposed research. The module is assessed by 100% Continuous Assessment. 80% of the marks available are for group work and the remaining 20% is for an individual submission. Group work is assessed in four stages; stage 1 (20% of group work) represents the literature review, stage 2 (20% of group work) represents the methodology, and stage 3 (40% of group work) represents the findings and analysis section. Learners are provided with marks and feedback on their performance at each of these three stages. Stage 4 (the final 20% of group work) is for the resubmission of the final document; the Marketing Research Report. This report is also presented to the business. In the individual submission, worth 20% of the module, learners must detail their personal research reflections. This must include information on areas they had special responsibility for, reflection of the division of labour throughout the project, and reflection on the research limitations.

Sources: Correspondence with Vicky O'Rourke (vicky.orourke@lyit.ie); <http://www.lyit.ie/courses/businessstudies/lybussbmarketing/>

2.4 Second year business students undertake a research based paper at Bay of Plenty Polytechnic, Tauranga, New Zealand

The Polytechnic has a partnership with the University of Waikato to deliver the first 2 years of their business degrees through the NZ Dip Bus programme in Tauranga; students can then complete the remaining 3rd and 4th year (depending on which degree) in Tauranga or Hamilton.

Applied Management is a single semester research-based paper – generally undertaken in their second year - which requires student research teams to identify a management issue in an organisation, conduct research to identify problems and/or establish causes and recommend possible solutions. The paper necessitates collaboration between students and local organisations, and may involve solving problems identified by the organisation, or alternatively a deductive approach, exploring the application of a management concept, such as motivation, engagement or structure, using the organisation as a case study. Access to, and co-operation from the organisation is therefore a key component of successful project completion. Students work in teams to develop a research proposal outlining the background, rationale, research aims, methodology and an ethics statement. Research instruments are developed to gather primary data, a literature review scans relevant secondary data, and a research report and presentation outline the findings and recommendations. Finally students complete individual evaluations of the process.

For the majority of students, this is their first experience of research based study which necessitates the teaching of research methods, research ethics and writing a research proposal and report. Familiarisation with the 'language' of research is also needed. This material is covered in a series of seminars at the beginning of the semester, but once the proposal has been approved, research teams work independently under the supervision of the tutor, and tutors need to be aware of the varied level of support different groups and individuals may require in addition to academic guidance. Development of independent study skills is vital to student success. The research-based paper enables students to synthesise material studied in their other papers and provides students with the opportunity to investigate a management topic in depth. Results are excellent, in terms of student retention and success. Participants produce a tangible outcome which can be included in their graduate portfolio and the research and writing skills they learn prepare them for higher levels of study.

Source: Correspondence with Anne Bradley (Anne.Bradley@boppoly.ac.nz).

Prescription: <http://www.nzqa.govt.nz/assets/qualifications-and-standards/qualifications/NZ-Diploma-in-Business/Prescriptions/636-applied-management-V2.pdf>

2.5 Engaging students in applied research through a community sports development consultancy project at University of Central Lancashire, UK

The final year Community Sports Development module acts as a capstone module for Sports Coaching students. This module is an optional module which is taken in addition to the honours dissertation. Students work as a project team through a consultancy brief with a partner agency and recommend strategies that can be employed to support community development through community sport and coaching initiatives. There are normally 8-12 consultancy briefs divided up among the 40-50 students, with students creating their own consultancy teams. Examples of consultancy projects include:

- A “health check” of football refereeing in Blackburn
- Community Sport and Crime Reduction
- Community Sport (“Street Dance”)

The emphasis is upon the students creating professional working relationships with the client organisations in order to carry out primary research that is directed by the clients and supported by the Academic staff at the University. Students are expected to hold regular review meetings with the clients, carry out interviews with relevant stakeholders; use secondary research to help analyse their findings; and present their work and recommendations to the organisation through the staging of a mini-conference, where all the partner groups are invited. Representatives from agencies provide the feedback on students’ work, judging on the content, feasibility of solutions, and competency in conducting research.

Source: <http://resources.glos.ac.uk/ceal/resources/casestudiesactivelearning/undergraduate/casestudy9.cfm>

2.6 Involving students in organisational consultancy, Middlesex University, UK

The module “Consulting to Organisations” aims to provide student with "real life" experience by engaging them directly as consultants with organisations and the issues that those organisations have identified as significant. On organisational premises, and in collaboration with the internal personnel there, a small team of students clarify the issue with their client. Information is then collected, using a variety of research methods, and analysed in the light of both academic theory and the specific organisational context. Recommendations for action, both orally and in writing, are made to the client. As well as experiencing the reality of the organisation, students also experience working with a team of diverse peers to produce credible outcomes. Initially, four developmental workshops are provided: these cover team building, consulting, organisational culture and client contact. Four feedback sessions are organised during the subsequent consultancy phase of the module. The parameters of the module are set out in a handbook, and within these students are expected to take responsibility for their own work and that of their team. This is a Level Two module of eleven weeks, normally undertaken by undergraduates in their second year. It carries the same credit award as any other module and feedback from students, from organisational clients and from a number of external examiners over the fourteen years the module has been in operation has been extremely positive.

Four modes of assessment are employed and they reflect the aims of the module and also provide a range of methods, which is thought to reflect the different strengths and weaknesses of the student group. All students are required to attempt, though not pass, all four of the elements: a written report and oral presentation to their respective clients, a team peer-assessment exercise and an individual learning report. The learning report requires students, on an individual basis, to identify and review their learning from both their experience of the module, with specific reference to their client contacts, and their experience of working in a team. The areas addressed are knowledge, skills, attitudes and emotions.

Sources: Correspondence with Philip Frame (2006); Frame and O’Connor (2003); http://www.mdx.ac.uk/courses/undergraduate/human_resource_management/human_resource_management_ba.aspx

3. Education, Law, Social and Environmental Sciences

3.1 Students undertake a vocational research project in the Foundation Degree Public Services: Policing Studies at Sheffield College, UK

Students are required to complete a research module in year two (level 5). A blended teaching approach is adopted to provide support and opportunities to enable students to become autonomous learners. This is of particular importance to those wishing to progress to level 6 where they will be required to complete a dissertation. Having said that, most careers within the criminal justice system involve a degree of project management, research and report writing, so the module aims to provide key employability skills.

Given that the qualification is of a vocational nature, the topic or issue is ideally drawn from the student's work based learning placement and should be of specific interest to them. Examples from the current cohort are:

- A Special constable conducting research into the views of police colleagues towards the quality of personal protection equipment
- A Special constable conducting research into the attitudes of young people towards the police
- A student working with the government pilot criminal justice panels, conducting research into the public's general knowledge and attitudes towards restorative justice.
- A student working with youths on the edges of criminality conducting research into the attitudes of young people in relation to stop and search.

Learners are expected to formulate specific, measurable aims, carry out a literature review, examine and employ appropriate research methods and collect and analyse findings. Overall it is critical that consideration is given to research in methodological and "real world" crime contexts. Whilst the assessed piece consists of a 4,000 word report, students are encouraged to discuss their findings and recommendations with their WBL employer and future potential employers.

Source: Correspondence with Joan Rudder (Joan.Rudder@sheffcol.ac.uk)

3.2 Students studying Bachelor of Early Childhood Education and Care undertake an action research project at TAFE NSW, Australia

As a compulsory part of a Bachelor in Early Childhood Education and Care, students study research methodology in two twelve week semesters, as part of the second and fourth years of the degree. These research units consist of four hours of face-to-face learning each week to explore the different components of the action research model using inquiry-based learning. As part of learning about and implementing qualitative and quantitative research, students are required to conduct a research project based on an area of change they have identified in consultation with staff at an early childcare service. Working in pairs, students are required to complete a research proposal, implement their research in an authentic work-based context and write up their findings. The student pair up and then make recommendations based on the findings. Ideally these recommendations are taken up by the childcare centres in the future.

An example of research conducted compared two contrasting centre's school readiness programs which is defined as the transition preparing children for the move from centre based care or the home to school based settings. The student pair initially explored the relevant literature to clarify the best way to prepare children for school. Using qualitative research methods, the student pair conducted surveys of staff and parents asking about their beliefs regarding school readiness. The resulting data led to a finding that parents and staff had various and quite differing ideas on what constitutes a high quality school readiness program. The project recommended that more education for staff and parents about characteristics of school readiness programs which have proven to lead to positive outcomes would be beneficial to a program's success.

Source: Correspondence with Martin Brown (martin.r.brown@tafensw.edu.au);
<http://www.highered.tafensw.edu.au/courses/profiles/bachelor-of-early-childhood-education.html#.Ue5wEI21EgU>;
<http://www.highered.tafensw.edu.au/documents/20510-course-profile.pdf>

3.3 Inquiry-based learning introductory course for Social Sciences had a significant impact on students' subsequent performance at McMaster University, Canada

McMaster University has been running a first-year course for Social Sciences based on inquiry since the late 1990s. It is typically taught in groups of no more than 25 students assigned to an instructor, who are subdivided into groups of four or five students. All of the groups have the same curriculum, reading material, process of assessment and goals that are outlined in a detailed compendium. The classes meet for 12 three-hour concurrent sessions. Class time consists of a combination of exercises and tasks for building the students' critical abilities and time for students to share ideas about their individual inquiries with other students. Students investigate aspects of a broad social science theme, such as 'self-identity', and address a common inquiry question, such as: 'Why do images of ethnicity, race, gender, sexuality, age, class, or abilities help to create aspects of personal and community identity?' Students have to propose their own inquiry question, such as: 'Why do some children apparently become violent after watching violent cartoons while others seem to be unaffected?' They have to justify why the question is important in relation to existing literature. They then investigate the question through a process that involves developing and testing hypotheses using secondary sources. There is strong research evidence of the positive impact of this inquiry course on the subsequent performances of students at McMaster University.

Sources: Justice *et al.* (2002, 2007a, 2007b, 2009); socserv2.mcmaster.ca/Inquiry/CourseOutline.htm. For more recent versions of the course see: http://www.youtube.com/watch?v=i9idE_uClpc ; http://cte.uwaterloo.ca/research_on_teaching_and_learning/TBRG/OND/2011/Presentations/Vine.pdf

3.4 Law students conduct interviews with practicing lawyers at Griffith University, Australia

A 4,000-word research assignment for *Lawyers, Clients & Legal Services*, an elective taken in the fourth or fifth year of a Bachelor of Laws program, involves in-depth interviews with at least two practising lawyers. Every week for a period of six weeks, the lecturer invites one practising lawyer to attend class during which the lawyer is interviewed. In this way, the lecturer models the interview process with six different lawyers, each with different areas of expertise. Students learn about the interview process and also gather research data for their assignments. The written assignment includes:

- Identification and justification of the research question(s) chosen by the student
- Literature review (identification and thorough analysis of relevant sources)
- Methodology employed
 - Presentation and analysis of data with reference to the literature
 - At least two in-depth interviews with practising lawyers
- Reference to data from at least three in-class lawyer interviews
- Conclusions that relate directly to the research question(s)

This applied assignment has several research-based learning related benefits to students:

- It provides them with experience in conducting research interviews and the skills to carry out basic empirical research. These skills are transferable to the students' professional life as lawyers frequently conduct client interviews.
- It gives them an opportunity for inquiry-based learning through interaction with 'real-world' law professionals who provide students with legal practice insights that are not available in the standard Australian legal curriculum.

Source: <http://trnexus.edu.au/uploads/examples%20June%203/Law%202.pdf>
<http://www.griffith.edu.au/criminology-law/griffith-law-school/programs-courses/clinical-program>

3.5 Community-based research in law at Warwick University, UK

The Centre for Human Rights has one of its aims to facilitate the participation of postgraduate and undergraduate students in human rights research and experiential learning opportunities. It supports undergraduate students through both co-curricula opportunities such as internships and through the formal curriculum to work with various communities local and international. In the Death Penalty Internship Programme selected students have two month internships in Capital Defenders Offices in the USA. Student work on: United States legal research, manage case files, contribute to the briefs filed in state and federal courts, interview witnesses and jurors in appeals cases and visit prisons, including death row. Also in partnership with Coventry Law Centre, Warwick students have helped to

deliver advice and information sessions to the local community on issues of discrimination and law. There are related formal courses that provide related student involvement in practice based research. Thus the module Human Rights in Practice combines academic study of human rights and a practical project that exposes students to the notion of applied human rights. Students are organised in groups so as to pursue projects in the local community.

Sources: <http://www2.warwick.ac.uk/fac/soc/law/chrp/aboutthecentre>;
http://www2.warwick.ac.uk/fac/soc/sociology/rsw/undergrad/cetl/fundingopps/fellowships/fellows/williams_final_report.pdf; <http://www2.warwick.ac.uk/fac/soc/law/chrp/projects/>;
<http://www2.warwick.ac.uk/fac/soc/law/chrp/projects/>

3.6 Giving students first-hand experience of research-based consultancy in environmental management at University of Queensland, Australia

Team-based problem-based learning is used in the final year capstone course for the Environmental Management, Rural Management Environmental Tourism and Tropical Forestry degrees at the University of Queensland's Faculty of Natural Resources, Agriculture and Veterinary Science to give students experience of research-based consultancy. It is a year-long course, team taught by an interdisciplinary staff (in recent years, a social scientist and an ecologist for the internal students, a multi-skilled environmental manager taking the external students). The staff solicit suitable 'problems' and clients among their contacts, for instance from government agencies, non-governmental organisations, or land care groups, or the private sector. The staff may help the client mould the topic to achieve appropriate degrees of difficulty, and equity in workload and difficulty across the student groups. The students work like consultants to their client, coping if the client changes the brief during the year (as many do a couple of times). They work in groups of about six students. The clients come to campus at least three times, for an initial briefing to their students, and presentations at the ends of first and second semester. They liaise with the students all year, usually off campus at their offices, and by phone and email. The staff give a flexible program of lectures in first semester, to prepare the students with skills they need towards each forthcoming step of their tasks, and in group processes. At the end of the year their report is 'published' (printed and bound) for the clients. Peer and self-assessment are used to distribute group marks among the contributors.

Source: Correspondence with Helen Ross, 2006

3.7 Community Outreach Research Project to Produce a Media DVD, at Southern Cross University, Australia

Students in *Advanced Screen Production* taken in either the second or third year of the Bachelor of Media or the Bachelor of Arts (media major) undertake research projects involving working for a community group on a community event in accordance with a supplied brief, to produce a DVD. As part of the project, students undertake research into the topic area, the interviewees, the location, equipment and context. As well as submitting the DVD for assessment, students are required to provide regular progress reports, to document the rationale for their project and discuss the process they went through to produce the DVD.

Source: <http://trnexus.edu.au/uploads/examples%20June%203/Media%20Studies%202.pdf>

4. Science, Technology, Engineering and Mathematics

4.1 Engaging students in applied research through industry sponsored collaborative capstone projects at Northern Alberta Institute of Technology (NAIT) Edmonton, Canada

NAIT's applied research program gives students the opportunity to put their learning to work in an applied, real-world project. They work with faculty, industry, and community partners to investigate problems and opportunities proposed by our partners or sponsors. There follows two examples of capstone projects.

Students in the Bachelor of Technology in Technology Management (BTech) must demonstrate the integration of their learning through a Capstone applied research project before graduating. Partnerships are formed between BTech, industry sponsors, and student groups of three to four students, in order to pursue 'real world' applied research projects to solve industry problems. A faculty guidance team works closely with the student groups to generate research questions, develop research plans, gather and analyze data, and propose solutions. Projects in

LEAN manufacturing, IT solutions, alternative energy, construction, and government policy are examples of applied research that has been undertaken in the capstone project. Students prepare a research report and present their findings publicly in a capstone symposium that is attended by industry representatives, faculty, and the general public. Curricular themes such as applied research methods, leadership, project management, ethics, and communication are emphasized throughout the capstone project as a way to transfer program knowledge to its many applications in society.

The Information Systems Development Major of the Bachelor of Applied Information Systems Technology (BAIST) degree program allows for students to interact and work with industry partners in the creation of a solution for a partner's needs. Students undertake two four month full time paid work experience. The work integrated learning internships make up the entire 4th year of the BAIST degree program. Students combine their technical and managerial skills to develop a scalable enterprise system for a real client. Some students have the option to engage in research work in integrating large system components into a complex organization. They are expected to contribute fully to solving the companies' problems using IT. We also require students to complete research paper(s) for grading. Along with demonstrations and presentations to stakeholders combined with what the student has learned over the program, this course prepares the students to easily blend into a corporation's context.

Sources: Correspondence with Michelle Ivanochko (MICHELLI@nait.ca); <http://www.nait.ca/85862.htm>; <http://www.nait.ca/78678.htm>; <http://www.nait.ca/59951.htm>; http://www.nait.ca/44779_91344.htm?utm_source=nait&utm_medium=feature&utm_campaign=homepage&utm_content=BTechstudentsdevelopuniqueprototypes; <http://www.nait.ca/78568.htm>; http://www.nait.ca/course_BAIS4991.htm?AsOfDate=2013-08-01

4.2 Inquiry-based learning in the Digital Media & IT (DMIT) program at Northern Alberta Institute of Technology (NAIT) Edmonton, Canada

Inquiry-based learning is an integral component of the Digital Media & IT gaming, programming and business analyst courses. In our advanced 4th semester gaming courses, students working in groups are using a brain computer interface device to explore concepts such as how will this tool change the world of gaming, how we can implement it in current games, what other fields could utilize the tool and building a game using the X-Box platform to show proof of concept. As a class, our business analyst students are working with a zoo to explore building apps for apes, more specifically what games would an ape play, why would they want to interact with the game and if successful could they suffer from gaming addiction as some human do. Working on this project, our students not only research primate cognition, but also how primates relate to humans in their interactions and decisions. In both cases the benefits of using inquiry-based learning was substantial. Other students in the program, as part of a partnership NAIT has with the Alberta Health Services' Glenrose Rehabilitation Hospital, have investigated how iPad technology can support disabled patient rehabilitation.

Sources: Correspondence with Michelle Ivanochko (MICHELLI@nait.ca); <http://www.nait.ca/78131.htm>; <http://www.youtube.com/watch?v=ywv2sq7cM-E>

4.3 An experiment with client defined applied research in a two-year engineering technology program at Northern Alberta Institute of Technology (NAIT) Edmonton, Canada

The two year Electronics Engineering Technology diploma program at the Northern Alberta Institute of Technology (NAIT) has traditionally included a fourth semester project course. Every student taking this course would identify a project that required them to design, build and demonstrate a microcontroller based product that incorporated several of the major themes taught in the two-year program. Our industry advisory board has been asking for greater development of real-world team work skills in our graduates so they can be effective at applying their technical abilities sooner. Rather than work in isolation on self-defined projects that may or may not have relevance to industry, we wanted to engage students in teams working on client-defined projects that were clearly relevant to industry.

An opportunity arose in 2012 to collaborate with University of Alberta researchers developing a cryogenic bio sample retrieval system. A mechanical gantry robot had been fabricated at the University. We were asked if our students could work on the control system for the robot. We offered the project to our fourth semester students. Volunteers were interviewed by the University researcher and by NAIT faculty. A team of four students was formed

along with a NAIT supervisor and a University liaison. The team met with researchers at the University and a challenging but achievable scope of work was defined with deliverables at the end of the semester. The experience of working on a client-driven problem with all of the messy non-text book problems encountered in a real world setting provided excellent skill development for the team. Our student team delivered a solution within the scope of work and the client was very pleased. Based on the pedagogical success of this experiment, we are looking for more opportunities to have our students collaborate with industrial clients.

Sources: Correspondence with Michelle Ivanochko (MICHELLI@nait.ca); <http://www.nait.ca/76768.htm>

4.4 Computing authentic learning through student research projects at Louisiana State, US

It is difficult in computing to develop industry 'style' authentic research projects in the undergraduate curriculum. In industry, projects are likely to involve many staff and operate over a number of years. To meet this challenge, the Computing Science Department at Louisiana State has developed a range of long term projects involving undergraduates, postgraduates, faculty and outside 'industry' partners. Ideally each project has a compelling 'story' that would interest the students. Second, the project needs to be large enough that it will take the work of many people over several years to complete the project. Third, there has to be useful partitions of the project, so that a single student or small group could complete in one or two semesters. Finally, projects need to be relevant to both undergraduate and master's level students would need to be available.

One such example is a long term link to develop an effective computer based climate monitoring with a local Watershed Management Institute with a conservation focussed bat habitat. This needed a computer based monitoring of the environment established. This required students to work on a whole range of discipline based issues including network routing, data aggregation and data visualization – all of which could be expanded by students in subsequent employment to related (non-bat) scenarios.

Source: Fife (2010); <http://reu.lasigma.loni.org/>

4.5 Students as research consultants for Street Games at Nottingham Trent University (NTU), UK

This case study works within the confines of the NTU, but creatively tries to encourage students to develop links with professional organisations which will support them in their future careers. Students are encouraged to use the dissertation experience to develop links with employers and develop practitioner contacts. The aim of this project is to undertake research within a professional organisation where the student will act as an external consultant and provide evaluative feedback to that organisation. For the purposes of this case study one student project is used to illustrate the nature of researching and writing a dissertation thesis in consultation with a professional organisation. The student conducted research with the charity Street Games, an organisation which makes sport accessible to young people. Before undertaking the dissertation research at level 3 the student undertook a six week placement with Street Games in level 2 and began researching the organisation throughout the summer period, prior to undertaking her level 3 studies. The students' involvement and research with Street Games as an organisation has enabled her to develop key skills and professional relationships at the organisation and with the Local Authority. In addition to writing her research up in an 8,000 word dissertation the student produced an undergraduate research conference paper for UCLAN's Research Student Conference and provided feedback, with recommendations, to Street Games.

Source:

<http://insight.glos.ac.uk/TLI/ACTIVITIES/NTF/CREATIVEHOPS/EXAMPLES/Pages/Education,SocialandEnvironmentalSciences.aspx>

5. Interdisciplinary and Institutional

5.1 Involving Students in Interdisciplinary Interactive Media Consultancy Projects at Miami University, Ohio, US

Interactive Media Studies at Miami University is an interdisciplinary programme (including Computer Science, Engineering, MIS, English, Marketing, Graphic Design, Education, etc.) that brings together students and faculty to investigate how interactive media informs and transforms their disciplinary perspective. The programme has been running since 1996 and uses problem-based learning and team-oriented projects to help students to learn how to

apply their theoretical knowledge to innovative digital solutions for a paying client. The program has grown in size from one course in 1996 to nearly 30 in 2010.

About 100 students a year take the programme. Demand is high and they have to turn away 2-5 students a day from the programme. With 2-3 sections running each semester; the students work in groups of up to 20. The students themselves decide how to divide up tasks; typically there are groups undertaking development, design and marketing. The programmes are team taught with the last two weeks spent on de-briefing and talking about what they've learnt. The students are typically in class four hours a week, but spend many more hours, for example visiting clients, undertaking research or doing user testing. They make a presentation to their client at the end of the project.

Commercial companies are charged \$20,000 per project paid on delivery; non-profit organisations and charities are typically charged c\$5,000. They found the client did not take it as seriously when no charge was made. From the client's perspective, they get out of the box thinking that they would never obtain from a consultant firm. The clients typically end up with something that far exceeds their expectations. The students find it surprising and challenging to manage the changes which commonly occur during the development stage of the project.

Completed projects include:

- Healthcare IT asked IMS to create a new logo for their company and build a new Web presence to highlight their state-of-the art hospital tracking systems. IMS assessed needs and built the site, a product demo and a back end administrative system for managing sales and customer support.
- Procter & Gamble's Beauty Care Division contracted with IMS to develop a Web-based expert system that would allow customers to get product recommendations suited to their personal needs. A kiosk was designed to be deployed in a major retail chain.
- The Taft Museum of Art needed a complete Web strategy. IMS developed a web identity for them, put their collection online and created e-commerce capability for their gift shop.
- The consultancy service has worked with international clients and an international summer course has been added to the programme and recent courses have been held in Shanghai and Dublin.

Sources: Interview with Glenn Platt 14 November 2007; updated with <http://aims.muohio.edu/armstrong-interactive/>; <http://aims.muohio.edu/about-aims/>; <http://aims.muohio.edu/ims-minor/>; <http://aims.muohio.edu/ims-major/>

5.2 Theme-based Interdisciplinary research at Harold Washington College, Chicago, USA

Harold Washington College, one of the City Colleges of Chicago piloted an interdisciplinary undergraduate research project during the spring and summer semesters of 2013. City Colleges offer a wide range of access programmes including academic programs enabling transfer to four year colleges.

The focus of the research was the Chicago Waterways. Faculty members in Art, Biology, Chemistry, English, Library Science and Physical Sciences (Geology) and the Vice President of Academic Affairs worked with 17 community college students. Each faculty member worked with 2-3 students to do independent research about the Chicago Waterways. These students were either in their second or third semester and were nominated by the seven faculty members who participated. There were not specific criteria for selection (grade point average, semesters completed, etc.). The main criteria were students who showed passion for the subject matter and interest in participating.

Seventeen Harold Washington College students conducted research related to art, biology, chemistry, English and more for the Chicago Waterways Research Project. This interdisciplinary research learning community spent two semesters researching and learning about the Chicago River together. The students were guided in their research projects by faculty members in a variety of disciplines and learned how to conduct research in those different academic areas. This two-semester project culminated with a poster session where each student presented their final reports to faculty, staff and the college community.

In addition to doing the independent research with their faculty members, the entire group of students, faculty, and administrator met weekly in a variety of learning opportunities. Each of the faculty members presented a lecture and research based on their past experience and expertise. Several guest lecturers from other City Colleges and area

research universities were invited to present as well. The group also received lectures from area non-profit organizations including The Friends of Chicago River and together visited linked museums and organisations,

This pilot project has demonstrated that having an interdisciplinary, thematic approach coupled with structure weekly meetings, provided an engaging way for students to learn from a variety of discipline-specific perspectives, in an efficient and scalable way. The model is scalable because it leverages the experience of each faculty member to be used for the entire group and the weekly meetings are organized for all for all of the students so that each faculty member is only responsible for one session per term. This provides more time for the faculty member to mentor the student on the independent research projects. The administrator handles all logistical issues, created an email listserv for easy communication, and also updates the Web site. Based on the success of this pilot, plans are underway to institutionalize undergraduate research at The City Colleges of Chicago. The faculty and administrator on the project have reached out to faculty leadership across the District and will present their model at the District Faculty Development Week in August. In addition to the thematic learning community undergraduate model, Faculty will develop a standalone undergraduate research course that can be coupled with other general education courses to integrate research in other courses as well.

Sources: Correspondence with Margaret Martyn (mmartyn1@ccc.edu);
<http://hwcollege.wordpress.com/chicago-waterway-research-project/>;
<http://hwcollege.wordpress.com/chicago-waterway-research-project/chicago-waterways-calendar/>;
<http://www.chicagoriver.org/education/>

5.3 Students undertake consultancies for business and government clients in ‘Value in the Valley’ at two Universities of Applied Sciences, Netherlands

The educational design project ‘Value in the Valley’ was initiated by two Dutch institutions for postsecondary vocational educational (which are called ‘MBO’ in Dutch) and two universities of applied sciences (‘HBO’ in Dutch) in collaboration with two companies. The project aimed to address an increasing demand from industry and business for professionals who are able to contribute to sustainability-driven multidisciplinary and multi-sector innovations. Conventional study programmes (at MBO and HBO levels) are typically not aimed at educating this kind of knowledge worker.

A hybrid learning configuration was designed, implemented and evaluated in six iterations of one semester each. The learning configuration represented an authentic working context in the sense that it functioned as a consultancy firm in which assignments were carried out for companies and governmental institutions in the region. It was located at a business park. Students from the participating schools were the junior employees. The faculty, lecturers and educational consultants from the participating educational institutions as well as employees from the participating companies, acted as the senior employees. They coached, instructed and guided the students while they worked on the assignments. Most of the faculty worked part time at Value in the Valley and spent the rest of their time at their own educational institution or their company.

Participants included students enrolled in several different study programmes, mostly from the technical and ‘green’ (e.g. agricultural, environmental, land use planning) sectors in MBO and HBO. The number of students ranged from 15 to 35. The students worked in multidisciplinary and ‘multi-level’ (MBO and HBO) teams on real-life assignments that involved issues of sustainability. For example, in the ‘Sustainable village’ assignment, a step-by-step strategy was developed for villages to become a sustainable community, and in the ‘Rain in Groningen’ assignment, ideas were developed for the temporary storage of excessive rain that is predicted in local climate change scenarios. Students spent one semester at Value in the Valley, and the programme replaced a part of their regular curriculum (e.g. an internship or regular course). The faculty performed formative assessments at regular times during the semester. The summative assessment and assignment of study credits were conducted by lecturers within the students’ own study programme.

Source: Petra Cremers personal correspondence (p.h.m.cremers@pl.hanze.nl)

5.4 Institutional Research office supports local economic development and student research at Holland College, Prince Edward Island, Canada

The Applied Research Department at Holland College supports economic development for Prince Edward Island by solving technical and business problems for industry and community clients utilizing the college's expertise and facilities while enhancing the quality of college programmes. The research undertaken is focussed on key areas closely linked to the college curricula particularly Social Innovation and Science and Technologies. A central way that this 'external' research feeds into the curriculum is through the Applied Research Department supporting capstone projects that are a key feature of the two year applied degree program. Through its links with external local clients the Research Department provides the contacts and expertise for students to undertake a significant applied research capstone project. Two examples follow:

The two year ***Applied Degree in Culinary Operations program*** has a required practical, community-based research project in their final year of study. As part of the *Directed Foodservice Study* course, students conduct research in the foodservice industry within the Culinary Institute of Canada faculty and under employer supervision. The planning process (proposal development) for this research project takes place earlier in the program as a result of work completed in a course titled, *Food Service Study Seminar*. In the students' final year of study, they are expected to submit a project proposal by late fall so that their projects can be approved by faculty, the Applied Research department, and the Holland College Research Ethics Board. Research is timed to start in early January. Through the research process, students work independently with guidance from a faculty advisor and an industry liaison. The research projects enable students to implement new skills as they work to meet industry needs. Students are exposed to the entire research process from proposal and ethics application writing, to carrying out the actual project, compiling a report and finally preparing a presentation for a panel of experts. These applied research projects teach students how to carry out a project from start to finish, as well as offering networking opportunities between students and industry partners for potential future employment.

As a part of the two year ***Energy Systems Engineering Technology program***, students are given a choice between completing on-the-job-training or conducting an applied research project with an energy company. If they choose the latter they complete individual applied research projects as a part of the *Capstone Project* course in the students' final year of study. The projects focus on energy efficiency and renewable energy and can include information on consumer needs, habits, alternative energy sources, and recommendations. Students focus on the technical aspect of the project and are required to submit a proposal, write a report of their findings and present the final results to the class.

Sources: Correspondence with Audrey Penner (APenner@hollandcollege.com);

<http://www.hollandcollege.com/applied-research-at-holland-college/>

<http://www.hollandcollege.com/programs/applied-degree-in-culinary-operations/>

<http://www.hollandcollege.com/programs/energy-systems-engineering-technology/>

5.5 Institutional supported community based research Penn State Brandywine, USA

Brandywine is one of the twenty campuses of the Pennsylvania State University system. Its primary mission is providing two year entrance to disciplinary four year courses at other institutions – in particular the nearby Penn State. The institution is small, not well resourced, lacks equipment and does not have any graduate students who commonly play a supportive role teaching undergraduates in other institutions, yet over the years student involvement in research and inquiry has been embedded in a wide range of year one and two courses. Shaped by US conceptions of the 'scholarship of engagement' (Boyer 2000), a central feature of the formal curriculum and student and staff volunteering is a range of courses and projects that involve staff and students working and researching with community partners on issues of community concern.

A particular feature of the formal curriculum is the Intercollege Minor in Civic and Community Engagement (in many US institutions students have a central focus on one discipline – their major – but they may well take a significant but smaller number of courses in another discipline – their minor). Program faculty, drawn from across the University, encourage, recognize, and systematize student participation in public service or problem-based fieldwork and research. The minor culminates with an approved capstone project. This may be a significant paper, or annotated portfolio, or other demonstration of substantial reflection upon and integration of the minor experience and the broader issue of application of academic theory and practice in the civic community.

Sources: Guertin and Esparragoza (2009); <http://www.brandywine.psu.edu/>; <http://engage.bw.psu.edu/>; http://brandywine.psu.edu/Academics/Degrees/civcom_minor.htm; <http://brandywine.psu.edu/Information/Community/outreach.htm>

5.6 Cross-discipline faculty-student community development in Uganda at University of San Diego, USA

Led initially by the Graduate School of Nursing, the University in collaboration with partners in Uganda has developed a cross-disciplinary initiative to research and community development project in Mbarra, Uganda. The focus is to save the lives of many children at risk from preventable diseases. Now involving disciplines including nursing, business, biology, and education, cross disciplinary teams of faculty and selected undergraduates have undertaken a range of investigations. Following graduation a number of these undergraduates have returned to work as interns in hospitals in the region.

Sources: James *et al.* (2009); <http://www.holyinnocentsuganda.com/Default.htm>

5.7 Engaging students in research into teaching and learning at the University of Western Australia and University of Exeter

The Undergraduate Learning and Teaching Research Internship Scheme (ULTRIS) was conceived at The University of Western Australia (UWA) to introduce undergraduate students to authentic research outside their chosen discipline. By focusing their research on a teaching and learning issue of identified priority for the University, students are able to make significant contributions to the understanding of the problem and provide insights to inform future changes in policy and practice. Beyond the benefits to the institution and the individual students, this model of undergraduate research heralds an opportunity for research into teaching and learning to gain acceptance and interest amongst a new and previously uninvolved cohort of investigators.

At the **University of Exeter** students are engaged as partners in shaping and leading their own educational experiences through their '**students as change agents**' initiative. The key concept is that students themselves take responsibility for bringing about change, based on their own research on aspects of learning and teaching. The approach enables students to be actively engaged with the processes of change, often taking on a leadership role. They are engaged deeply with the institution and their subject areas, and the focus and direction is, to a greater extent, decided by students. The most important aspect is the focus on research, and building change on evidence-based foundations. Students from across the university have contributed to this initiative, carrying out a series of research projects on their learning and teaching environment, selecting concerns raised through student-staff liaison committees (SSLCs), and providing recommendations and solutions to improve their experience. A small amount of funding was made available from the University's learning and teaching budget to support this initiative. Students worked as apprentice researchers; their research methods included focus groups, informal interviews and questionnaire surveys. Outcomes were presented at a student-staff conference, which resulted in institutional engagement with key research findings. Each small project has also been captured through a case study. Student research has driven organisational change, contributed to student engagement in shifts of policy and practice within the University, and supported students' graduate skills in the areas of research, project management and presentation of outcomes, leadership and understanding organisational development.

Sources: Partridge and Sandover (2010); Kay *et al.* (2010); Dunne and Zandstra (2011).

For many more case studies of students as change agents see: www.mickhealey.co.uk/resources

5.8 Engaging students in curriculum based research projects with community organisations through a Science Shop at Queen's University Belfast, Northern Ireland

The Science Shop was established in 1988. Based on a model developed by students in Dutch universities, the name is literally translated as 'knowledge exchange'. The Science Shop works with Civil Society Organisations (CSOs) to develop research projects based on their research needs which are suitable for students across both universities to carry out as part of their degree programmes. This may include students undertaking any form of curriculum-based research, such as dissertations, research projects, group projects, placement modules with a strong research element and student selected components. Typically it involves students at later stages of their degree programmes when they already have some experience in their academic area.

Since 2007, the Science Shop has been funded by the Department of Employment and Learning through the Higher Education Innovation Funding Scheme (HEIF). During the last three years of HEIF funding, 320 projects were developed with 110 CSOs, of which 200 were completed. Over 400 students in total were involved in completing these research projects at both postgraduate and undergraduate levels and in a range of disciplines. These included Anthropology, Architecture, Biological Sciences, Geography, Management, Medicine, Nutrition, Sociology and Social Policy. To see students and CSOs talking about their experience of undertaking projects see <https://www.qub.ac.uk/sites/ScienceShop/CaseStudies/>

Students often reflect on the fact that they have learned about different types of knowledge and that applying their knowledge in a real context has caused them to think about their academic subject in a different way. For example, students from business disciplines applying their skills and knowledge to research questions in a not for profit context. Some students enjoy the research process and it can inspire them to continue with further study, whilst others learn that they do not like undertaking research. For some students it can prove to be the most challenging part of their degree whilst for others it is the most rewarding. Academics feel this process considerably enhances student learning and that the Science Shop processes ensure that students are fully supported without requiring a significant additional time commitment from them.

The Science Shop at Queen's University was a founding member of the Living Knowledge International Science Shop Network (<http://www.livingknowledge.org/livingknowledge/>) and is also a partner in the Public Engagement with Research and Research Engagement with Society European Commission funded project (<http://www.livingknowledge.org/livingknowledge/perares>), supporting the development of other Science Shops across Europe and developing resources in community based research through the curriculum.

Further information: www.qub.ac.uk/scisho; www.livingknowledge.org;
<http://www.livingknowledge.org/livingknowledge/wp-content/uploads/2012/02/scienceshop-brochure.pdf>;
<http://www.rug.nl/science-and-society/science-shops/?lang=en>

For more information about this topic and references see:

- Healey, M. 2005. Linking research and teaching exploring disciplinary spaces and the role of inquiry-based learning, in Barnett, R (ed) *Reshaping the university: new relationships between research, scholarship and teaching* McGraw-Hill/Open University Press, 67-78
- Healey, M. and Jenkins, A. 2009. *Developing undergraduate research and inquiry*. York: HE Academy
http://www.heacademy.ac.uk/assets/York/documents/resources/publications/DevelopingUndergraduate_Final.pdf
- Healey, M., Lannin, L., Stibbe, A. and Derounian, J. 2013 *Developing and enhancing undergraduate final year projects and dissertations*. York: HE Academy
http://www.heacademy.ac.uk/projects/detail/ntfs/ntfsproject_Gloucestershire10
- Healey, M., Jenkins, A. and Lea, J. 2014. *Developing research-based curricula in college-based higher education*. York: Higher Education Academy. Available from: <http://www.heacademy.ac.uk/college-based-he/research-based-curricula>
- Healey, M., Flint, A. and Harrington, K. 2014. *Engagement through partnership: students as partners in learning and teaching in higher education*. York: Higher Education Academy. Available from: <https://www.heacademy.ac.uk/engagement-through-partnership-students-partners-learning-and-teaching-higher-education>

The following sets of case studies and bibliographies are regularly updated. They are available at:

www.mickhealey.c.o.uk/resources

Linking teaching and research through engaging students in research and inquiry

Linking teaching and research: A selected bibliography

Students as partners and change agents in learning and teaching in higher education

Students as partners and change agents: A selected bibliography

Case studies of research-based curricula in college-based higher education

Research-based curricula in college-based higher education: A selected bibliography

A project planning template

Please complete as many of the following sections as are relevant to your project. You may wish to replace some headings if they are more applicable to your project.

Title	
Leader(s)	
Department/ Institution	
Aim(s)	
Rationale and evidence of need (e.g. from literature)	
Timescale	
Participants/ Stakeholders	
Methods/ Programme	
Outputs (e.g. learning resources, publications, workshops)	
Outcomes (i.e. what will be different in terms of stakeholder behaviour as a result of project)	
Evaluation/ Evidence of impact plan	
Other information	