

BLASTER: The Best Liberal Arts and Sciences Teaching Expanded and Reinforced

A collaborative research project exploring Liberal Arts and Sciences education in Europe

University College Roosevelt Case study for inclusion in CURLAS:2017

Integration of research into an undergraduate curriculum

Henk Meijer, Frans van Overveld

Dept. of Science,
University College Roosevelt,
Lange Noordstraat 1
4331 CB Middelburg, The Netherlands

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Introduction

Stimulating and innovative research is widely recognized as a key European challenge. Undergraduate research is at the heart of Liberal Arts and Sciences (LAS) teaching and student learning and enables instructors to straddle teaching and research. This document presents practical examples of the integration of research into an undergraduate curriculum. It is hoped that this will contribute to the quality and relevance of undergraduate education in general. It will also, more specifically, add to the innovation in European education called for in a number of ways: by strengthening the knowledge triangle and promoting (social) entrepreneurship amongst young people.

At the University College Roosevelt (UCR) students conduct research from their very first year onwards. UCR students have published in peer-reviewed journals and presented their work at conferences. UCR has a number of externally funded projects to support and strengthen undergraduate research. To increase the number of venues where undergraduate students can publish their work, UCR helped set up the very first Dutch undergraduate research conference in 2009. This conference is organised in cooperation with the Association of Dutch Universities (VSNU) and has been organised annually since 2009. In 2016, students from the Biomedical Track at UCR have set-up a peer-reviewed biomedical journal “Science of the Human Body” for undergraduate students of university colleges in the Netherlands to facilitate publication of undergraduate research projects (<http://humanbody.school/>).

Research in UCR courses

Courses at UCR are organised in tracks, sets of one or more first, second and third year courses in a subject. Research has to be a part of every track, in all years of study. A track document contains a section called “program outcomes” in which the track coordinator and instructors

specify how research is addressed in the track and its courses. In general, the students learn to apply aspects of the main research methodologies of the discipline. In addition, they learn to apply academic standards of honesty through the use of careful research, using the conventions of academic styles, documenting and citing original sources. Some specific research skill, such as learning how to create a bibliography are taught in courses of the Academic Core department. For example, UCR offers courses such as “Argumentation and Rhetoric” and “Writing Across the Disciplines”. In subsequent sections of this document, we give examples of research requirements as they can be found in the track documents. To summarise, we can say that in first year courses students learn about research areas in a particular subject, read research papers, learn how to formulate a research question, give short classroom presentations, and write essays. In second year courses, students are asked to complete small research projects, present the result in the classroom, prepare posters, and write essays. In their third year, students typically complete a larger research project, either individually or in groups. There is also a requirement to complete at least one larger project, called a capstone project. In the section Capstone project, we present the UCR rules with respect to these projects.

Research in first year courses

Below is a list of phrases copied from the research requirements for first year courses as can be found in the UCR track documents. We did not list the course where the phrase comes from, any reader can determine whether a particular idea might be of use in his or her own course.

Learn how to use the library, use other scholarly sources, give in-class presentations and lead in-class discussions. Introduction to sources such as texts and artefacts, historical evidence in virtual and walled archives. Complete research on a topic handed-out by the instructor. Write an essay. Employ basic research methods in linguistics and select data and analytic tools. Complete specific library tasks. Prepare a critical bibliography on literary topics. Identify and develop research topics and questions that provide new insights. Research a point raised or argument made in a scholarly article that a student found compelling or questionable. Illustrate your research based contentions, conclusions and questions with statistics, charts, illustrations, art, music, relevant links, etc. Relate experimental observations related to theoretical models and homework exercises. Write a critical review of a scientific article. Use the library to do research on existing knowledge in the anthropological field and undertake participant-observation. Analyse a media report related to geographical issues. Present and write an essay about a political philosopher, applying philosophical positions to current political questions. Analyse existing data using appropriate data-collection techniques and methods of data analysis. Write an intervention report, and execute an intervention contributing to social-cultural change.

Below are five specific examples, three from science courses and two from social science courses:

- Perform a small coffee project: students explore coffees and spent coffees for analysis of fatty acid content.

- Study the effect of changing ratios of salicylic acid and acetic anhydride on the crystal/non-crystal aspirin products that are produced in the lab.
- Conduct field research into the properties of the sand in local dunes.
- Present an article on lynching, and question and research the author's contention that it was a form of amusement. Reflect on the historical significance of leisure.
- Write weekly entries in a gender journal. The entries comment on the ways class readings and discussions play out in daily life. The research heightens awareness and compels students to question the familiar.

Research in second year courses

As before we begin with a list of phrases copied from UCR track documents.

Oral presentation of a research proposal, poster presentation and discussions. Group presentations based on research findings of relevant sources. Employ the methods and theories in the field to research and write an independent research paper. Write a research proposal on a topic selected by the student, including an annotated bibliography. Assess different sources for research, and provide an overview of research done on a particular subject. Make use of specialised software to find specific antiquity sources. Complete library research on an issue in the field of political anthropology, in the field of development, taking an anthropological perspective, and on a specific issue relevant to the study of religion from an anthropological perspective. Prepare a research-based reading of a life narrative to highlight a set number of theoretical points. Critically review relevant research and existing literature in human geography. Perform a case study (a hypothetical fact pattern) and search an electronic legal research database to find the relevant and applicable law. Design and conduct a research project and draft an academic-style article, working both independently and in a group (paper, moot court and weekly class assignments). Independently identify research questions for in-depth literature review, conduct limited research in different cases, and engage in problem diagnosis using scientific research. Develop and write an intervention report, and execute an intervention contributing to social-cultural change. Develop and write an interview report, and execute and analyse the interview process. Perform fieldwork. Engage in autobiographical research, particularly using social media outlets, including interviews to activists. Perform simulation and real-life experiments and relate the clinical and laboratory observations to theoretical models in homework exercises, in-class discussions, and in-class assignments. Plan, execute, and record systematic exploration of adaptations of case study templates in geophysics assignments.

Below are three specific examples, one from an arts and humanities course and two from science courses:

- In the History of Women and Gender courses, students write weekly journals that record the ways the past is present in contemporary life. They look specifically at how in-class readings and discussions are still relevant. Students conduct open interviews of ordinary

and “extraordinary” people to explore the ways that gender plays out in daily life within different contexts. Each student gives one presentation on a scholarly article. It is a critical analysis that draws from primary research. As a final project, each student chooses a topic of interest. (S)he then finds a scholarly article on that topic and writes a critical review of that article by drawing solely from primary research.

- During a field trip to the Eifel in Germany, students are asked to research the impact of perturbations in the carbon cycle and study the composition of well waters.
- Students visit a materials and recycling company, and propose a treatment for slags at this company. They are then asked to explore leaching properties for which they have to design their own experiments.

Research in third year courses

As in most undergraduate programs, the final year of the program at UCR contains a capstone project. However, all other third year courses are also required to contain a research component. Below first a list of phrases from the UCR track documents.

Develop appropriate research questions, write for different forms of news media, such as print, radio, TV and online sources, build up a portfolio of papers and multi-media items. Individual research projects and oral presentations. Employ the methods and theories in the field to research and write an independent research paper. Research a topic of your own choice. Write a primary researched, thesis driven analysis that engages contemporary debates and draws from original research. Conduct open interviews, participant observations, craft blogs, internet forums, etc. Find, read and analyse topic-specific literature (also in other languages than English if the topic requires it). The systematic use of primary sources, the application of methodological frameworks on primary material and the use of a specialized academic library is expected. Identify a gap (issue, controversy etc.) in the research of the field and provide suggestions for how the gap in the research might be addressed. Design a research topic and conduct research based on a critical text about a film adaptation topic followed by a presentation. Relate experimental observations to theoretical models. Select appropriate methods and tools in relation to a specific research question and use it in homework exercises, a research proposal, and in-class tests (formative). Combine journal research with the results of exploring relevant methodologies to justify conclusions through individual and group term papers. Reformulate and adapt mathematical models to different situations, and analyse research papers from other related fields. Critically review scientific articles and select other appropriate methods and tools for making the correct analysis. Perform library research on specific issues relevant to the study of the state, globalization, and European transitions from anthropological perspectives, and on specific issues relevant to Cultural Studies. Research, analyse and discuss secondary source materials on a given topic, and examine the “energy-water-land” nexus, especially in developing country contexts. Research constitutional law issues through a comparative examination of national constitutions and court decisions interpreting the constitutions. Select a relevant research-topic, devise a relevant set of research questions and devise a practical research format. Complete an autobiographical research project.

Below are six specific examples, one from arts and humanities courses, four from science courses and one from social science courses:

- The final project of American studies introduces students to the art and excitement of primary research. In short, they explore a topic of interest either raised, addressed or overlooked in the class, by conducting primary research. The textbook and at least one scholarly article provide the historical context. Most do additional secondary research when they begin writing. The majority find the project both exciting and frightening. On the one hand, they study topics and delve into sources that they had not realized were historically significant. On the other, they are often afraid to form their own conclusions based on their research. The majority of students are used to summarizing the conclusions of others. The learning curve for all of them is steep. Some examples: one student is looking at Japanese internment during WWII, by analysing the art crafted by Japanese internees. Another is looking deeper into 100% Americanism in the late 19th century by analysing illustrations of exclusions by a contemporary political cartoonist. And yet others are studying recently de-classified CIA documents on the Guatemalan Coup; the journal of an unsung Conductor of the Underground Railroad; Memoirs of slavery; and music as a means of protest.
- Literature research and use of specialised analysis software: storage of radioactive waste, effect on the carbon cycle of carbon sequestration (CCS) or alternative energy sources, perception of people on nuclear fuel and CCS (exit polls after elections when those themes were prominent in politics).
- Do an environmental research project that makes use of environmental lab techniques learned earlier in the track. For example, use sediment cells as sensors, look at the biomineralization of selenium, the degradation of bioplastics and biogas production, the toxic effects of cigarette butt contaminated water on the planktonic crustacean *Daphnia magna*, compare filtration systems for effective removal of bacteria (like a Brita filter), and Blue energy efficiency.
- Students participate in so-called writing groups. Every semester a limited number of them may join senior faculty members in the Biomedical Sciences Track to write a review paper on an interesting topic in the field of expertise of the senior faculty member. The student will perform literature research and text writing. If the resulting review paper is of high quality, the results will be submitted to a journal (see, for example, *Vo Ngoc et al., Expert Review of Clinical Immunology. 2017, 13(4):371-382*).
- In Infection and Immunity, a project was started together with students of a secondary school to participate in a research project under supervision of undergraduate students in the course. The high school students collected data after becoming familiar with the research questions. Each day they met with their student supervisor. After data collection, the supervising students continued by analysing the data, and writing a manuscript for publication in an international peer-reviewed journal.
- In the field of psychology, the student will conduct consultancy research for a local organization, including library research, participant observation, expert interviews, semi-structured individual interviews, development and distribution of survey, and writing up of the final report. The final results will be professionally presented. The

student will also conduct library research, develop and write an intervention report, and execute an intervention contributing to clinical change in a research oriented approach. The intervention will take place in a mental health organization.

Capstone project

University College Roosevelt requires students in their final year to complete a capstone. The Capstone forms the pinnacle of three years of Liberal Arts and Sciences education. It brings together the insights and skills acquired during these years, consolidates them, and equips students for their future. In designing a unique approach to the Capstone, UCR builds on the experiences of the best Liberal Arts and Sciences colleges worldwide, as well as the extensive input of students, faculty and tutors. A first Capstone pilot was conducted in spring 2013. A more extensive policy was formulated for 2013-2014 and thoroughly evaluated with faculty and students. This resulted in a number of changes that were implemented in an updated Capstone definition that was used in 2014-2015. Most of these changes worked out well, and for the year 2015-2016 a relative small number of adjustments have been made. Input from faculty and students emphasized the need for a Capstone that allows for maximum autonomy of students and instructors in exploring their academic interests that typically results in a sizeable research output, comparable to a bachelor thesis. The Capstone should transgress and synthesize earlier academic experiences, and form the bridge towards the student's future. At the same time, the Capstone should build upon some of the unique elements developed over the past years: the Capstone Day, the profile every student develops by selecting courses and possibly pursuing extracurricular activities, and the emphasis on connections with the wider world.

Against this background, the Capstone experience consists of two elements:

Firstly, as not all Liberal Arts and Science (LAS) competencies can be demonstrated in a single piece of work, students will construct a portfolio showing the variety and quality of their work and their preparation for their future after UCR. In combination with the portfolio. Students write a reflection on the courses they have taken and what they learned from them. The portfolio and reflection requirements are formulated in such a way that they (hopefully) helps students to write master application letters and – where needed – to make career choices. The construction of the portfolio and reflection will be embedded in the tutoring process.

Discussions in regular tutor-tutee meetings should help the student expand and improve his or her portfolio and reflection. The tutor role is not to assess the final product, but to stimulate and encourage tutees to create a strong record of their accomplishments.

Secondly, there is a Capstone project which typically results in a research thesis to be presented during the Capstone Day or shared with the community in another way. Capstones have either a strong research component, be of an interdisciplinary nature, or are related to external organizations. The Capstone project encapsulates all UCR's learning objectives and philosophy of teaching and learning. Students complete a Capstone to demonstrate they have acquired the competencies expected of a LAS honours student. The Capstone consists of a major piece of individual work that is presented to the public on the so-called Capstone Day.

The work targets one of the UCR focal points: (i) Undergraduate research, in which instructors and students work side by side to generate new knowledge. (ii) Multi-disciplinary analysis of a complex multi-faceted problem, exemplifying the value of Liberal Arts & Sciences. (iii) Outreach to the wider community, stimulating global citizenships, and strengthening UCR as a “connected university”, with links to the world close by and far away.

Whereas Capstones will differ considerably, there will be a number of basic types:

- *General Capstone group*: In this Capstone, a group of 15 students (possibly divided into subgroups) works on their individual research project. They are supervised by an instructor who thus has approximately 13 hours to supervise each student/read/organize joint meetings. Students can work on a wide variety of topics in for instance the sciences, the humanities or the social sciences. Whereas there are collective meetings and specific deliverables during the semester, students work on separate themes and the emphasis lies on individual supervision
- *Thematic Capstones*: There will also be more thematic projects, in which students work on a common theme and depart from a common theoretical framework and body of literature. These research projects were in the past, and will be partially funded in the future by undergraduate research programs.
- *Connection Capstones*: Students often express a desire for more practical experience, like internships with organizations. The third year of their studies is a good time to gain such experience. At the same time, many companies and organizations in the province of Zeeland have expressed a desire to work more closely with UCR. Instructors and students are stimulated to seek such cooperation and to develop Capstones that contain a sizeable research component but also enable students to gain insight into the daily work in companies, hospitals and other organizations.
- *Student-led Capstone*: Students are allowed to propose a student-lead Capstone to the Board of Studies. Students are expected to present a course outline including an assessment procedure, indicate appropriate faculty support, and some guarantee that a sufficient number of students will participate in the Capstone.
- *Individual Research Project (IRP)/Honours Thesis (HT)/Academic Internship*: The familiar format in which students do individual work under the supervision of a faculty member are also suitable for a Capstone. All Academic Internships, IRP's and HT's automatically qualify as work for a Capstone.

Academic Internship

An Academic Internship is an interesting and valuable way for students to experience what it is like to work in a professional organization. Students may work in a variety of organizations, like a hospital, a museum, a court, a research lab, a ministry, an archaeological excavation, etc. Students will acquire knowledge and develop skills that are not readily learnt in a class room. An internship also gives students the opportunity to find out whether a particular workplace really suits them.

In an Academic Internship, students work on a specific project. Students are actively in pursuit of some pre-defined objective. Just shadowing a supervisor or following direct orders are not suitable forms of an academic internship. The project work must also have an academic component, and not be solely focused on a practical internal problem of some organization. In an Academic Internship, a student works under the direct supervision of a supervisor. The student receives (almost) daily instructions on what to do, and reports back to the supervisor several times a week. Of course, the student is expected to show initiative and do good work on his/her own, but the student is not expected to work as independently as for an Individual Research Project or an Honours Thesis.

Usually, an Academic Internship will take place in an organization outside of UCR. A student will have two official supervisors: one inside the external organization, and one UCR faculty Academic member. It is possible that a student does an Academic Internship without formal involvement of an external organization. In this case the Academic Internship needs to be part of a project run by a UCR faculty member. Such a project will typically be a research project, but other academic work can qualify as well. In case there is no external organization involved in the Academic Internship, it is particularly important that ample support of the student is made available. Normally this will require the involvement of at least two UCR faculty members. For each Academic Internship, a project plan needs to be drawn up. This project plan is primarily created by the supervisors, but of course the student will contribute. The Head of Department in which the Academic Internship takes place must also approve the internship. The project plan must be described in the “Academic Internship Request Form”. The main elements of the plan are:

Description and purpose of project

Briefly describe the organization or context in which the internship work will be done. What is the relevance of the work for the organization involved? How does the work relate to the advancement of science and/or benefit society?

Problem definition for student

What are the goals that the student hopes to achieve in the internship. A goal could be finding the answer to a specific question, communicate a message via outreach and/or education, contributing to improving organizational procedures, participate in a research program, reviewing literature to inform and update professionals, formulate an advice on solving an organizational issue or problem, contributing towards the creation or implementation of public policy, etc.

Planning of student activities

What are the start and end dates of the Academic Internship? What are the main student activities planned for each week? Typical activities may include: learning necessary skills, gathering relevant information, conducting certain clinical tests using certain equipment, creating and testing questionnaires, analysing data, critical analysis of literature sources, writing final report, etc.

Available facilities and support

What will be the workplace of the student? If applicable, what equipment / resources / facilities will the student be able to work with? Per day, how many people will be available at the student workplace to answer student questions about the project? Will there be a supervisor available for the student for every day of the project?

During the period of the Academic Internship, the student meets a supervisor several times to discuss progress. Student and supervisor are both responsible for communicating well and discussing material as efficiently as possible. In case of illness or other extenuating circumstances, both are responsible for making arrangements to communicate as efficiently as possible. In case it proves difficult to agree on suitable arrangements, the student or the supervisor may ask the Head of Department to decide what the appropriate way forward should be.

Final report

A final report should describe the internship activities and the results of the work. The format of the report should be one that is familiar to academics in the discipline, and be supported by the supervisors. A typical table of content contains the following elements:

- Introduction
Describe the organization or context in which the internship work is done. What is the personal motivation of student to do this work? What is the relevance for the organization, society and/or science of the work?
- Purpose and Objective
What are the goals that the student aimed to achieve in the internship?
- Methodology and Techniques
What are the main activities undertaken by student? Did student collect information him/herself? If so, describe methods and procedures. Describe equipment and tools used. Describe what training was received from whom. What were the people the student worked with most, and what were joint activities?
- Literature review
Describe a critical analysis and the main lessons learned from the literature you studied. Literature may include policy documents, organizational procedures and protocols, archive materials, internal documentation, annual reports, professional periodicals, web and media material, academic journals or conference proceedings, etcetera. Make sure to include academic sources.
- Analysis
Describe how you have analysed the available data or integrated the information. Mention any software or tools used. List results of analysis, making clear how you obtained results.
- Conclusion
Reflect to what extent the purpose of the internship has been met. On what criteria do you base this assessment? What are the main lessons learned, what uncertainties remain? If you communicated your results aside from this report, please describe. What further follow-up work do you recommend?
- Appendices
Long tables, figures or documents may disrupt the flow of the report. It is often better to add such elements as appendices.

It is natural that the relative size of different sections depends on the nature of the project. Deviations from this template are allowed with the permission of the supervisors. When an

Academic Internship takes place in an external organization, this organization may have certain expectations of what and how they want a student to report. It can be fine that a student uses the same final report for both the external organization and UCR. It also may be the case however that the external organization prefers that some of the elements listed above are described only very briefly. In such a case, the UCR supervisor may insist that the student addresses the item at greater length in the final report written for UCR.

Individual Research Project/Honours Thesis

An Individual Research Project (IRP) and an Honours Thesis (HT) are interesting and exciting means for students to hone both research and analytic skills. Students develop these skills and gain knowledge about the perspective(s) and method(s) of a particular field/fields under the guidance of a supervisor.

By collecting, processing, and analysing primary and secondary sources, students experience the research “cycle”: the process of collecting materials to research a question and finding new questions that merit further investigative research that might even change the focus of their study. They present their analysis in a final paper. An IRP/HT requires intense effort on the part of the student and regular meetings with her/his supervisor.

While an IRP an HT are similar in nature, there are some differences. Students doing an HT are expected to work more independently. A supervisor will apply stricter standards for an HT than an IRP, both in terms of quality of content as in clarity of argument and writing. Finally, there are some differences in assessment. The grade of an IRP will be – more or less – equally based on both the research process and the final result. The grade of an HT will be based for the largest part on the quality of the final thesis, and less so of the research process.

Students are advised to start some work and fine-tune the project in the break preceding the semester of the IRP/HT. It is important to have a well-defined problem definition in place before the start of the semester. Students should realize that changing direction can be difficult or impossible once the semester has started – such a change is only possible with the explicit support of the supervisor.

A student is advised to start looking for a supervisor early. A faculty member can only supervise a small number of projects in the same semester, so an instructor may reject a late request because he or she is already “fully booked”. A student should find a supervisor that has expertise in the topic the student wants to research. It is common that a student adjusts his or her plans to match the expertise and expectations of the supervisor. A supervisor must be an instructor at UCR. It is possible to have external experts as a second supervisor.

If either the student or the supervisor feels before the start of the semester that a good problem definition or a fruitful student-supervisor relationship is lacking, they are both entitled to withdraw from the IRP/HT. Both student and supervisor should inform the Head of Department and the Director of Education of this. The deadline for this is the first week of classes of the semester – as the student is required to enrol in another course.

It is the responsibility of the student to do the planned work to the best of his/her ability, communicate the results of this work in an appropriate way, and share any questions or problems with the supervisor. It is the responsibility of the supervisor to provide constructive

feedback on work done by the student, and give advice (solicited or not) on how the student can best move forward. The supervisor also checks that the task the student undertakes can reasonably be completed in the time available, and informs students of the appropriate professional standards for doing research and writing the final thesis. The supervisor will do all this with both the quality of the work and the interest of the student at heart. The student will follow the advice of the supervisor.

During the semester, the student and supervisor meet several times to discuss progress. Student and supervisor are both responsible for communicating well and discussing material as efficiently as possible. In case of illness or other extenuating circumstances, both are responsible for making arrangements to communicate as efficiently as possible. In case it proves difficult to agree on suitable arrangements, either student or supervisor may ask the Head of Department to decide what the appropriate way forward should be.

The number of meetings per semester may of course vary greatly depending on the specific project and the student's needs. As a guideline, it is suggested that for an IRP, 10 or more hour-long meetings are scheduled during the semester. For an HT, 6 or more hour-long meetings should be scheduled during the semester.

Students completing a Capstone, an IRP or HT are supposed to demonstrate mastery of all UCR program outcomes:

1. Acquire knowledge/perspectives in relevant domains
2. Grasp relevant objectives, assumptions and values
3. Understand state-of-the-art knowledge
4. Critically review results, arguments, problem formulations
5. Adopt and exercise relevant academic attitudes
6. Understand/apply domain knowledge in other contexts
7. Grasp interdisciplinary issues within specialization
8. Develop and apply new knowledge, methods, skills and expertise
9. Communicate at scholarly level
10. Reflect on personal/academic growth and development
11. Master with autonomy a range of specialist topics in preparation for further academic or professional training
12. Function effectively in team-based projects or exercises

Conclusion

The activities related to undergraduate research serve to put research at the heart of the student learning experience. Undergraduate research is research conducted shoulder-to-shoulder, jointly by faculty and students. As such, it bridges the divide between teaching and research. The spin-offs here are far-reaching. For one, undergraduate research stimulates a life-long love of learning amongst students and often stimulates them to opt for a research career. The guidelines and the show-casing of best practices will also serve to strengthen support for funding and enabling undergraduate research in Europe.

We like to end with an excerpt from an article by the former dean of UCR, Prof. Dr. Barbara Oomen.

“Research here can be understood as – the thoroughly thrilling but laborious – activity of generating new knowledge on the basis of a well-formulated research question, grounded in theory, on the basis of suitable research methods. Roth speaks of “an emphasis on inquiry and critical thinking – learning to develop as an autonomous person by shedding illusions and acquiring knowledge through research” [1]. Collini reminds us how schoolchildren are taught, and students at university study, and “undergraduates are being introduced to the modes of enquiry appropriate to various disciplines; what they develop, ideally, is not simple mastery of a body of information, but the capacity to challenge or extend the received understanding on a particular topic” [2].

It is not without reason that undergraduate research is such an important part of liberal education all over the world. The added value of a liberal arts and sciences context is that of multi- and even interdisciplinarity, the perusal of a wide range of disciplinary perspectives that can add depth and context to the academic enquiry on any given topic.”

[1] Michael J. Roth, *Beyond the University: Why Liberal Education Matters* (Yale University Press, 2014).

[2] Stefan Collini, *What are universities for?* (Penguin, 2012)