Calhoun Discovery Program Evaluation Summary

The Calhoun Discovery Program (CDP) has included an evaluation component using an academic plan model as a process for reflective practice and continuous improvement. The term "academic plan" refers to a wide range of activities and practices that shape the day-to-day efforts that go into both the management and delivery of the program's curriculum. It also includes the learning experiences of students as well as engagements with external stakeholders. As educational scholars Lisa R. Lattuca and Joan S. Stark explain: "Thinking of a curriculum as a plan encourages consideration of *all* of the major elements, rather than attention to singular aspects such as specific content or particular instructional strategies" (4). Academic plans encompass multiple realities and experiential perspectives that must be evaluated by delineating the relationships that link the "whole and its parts" to one another. The aims for embedding an "external evaluation" element in the Calhoun Discovery Program include:

1. Continual Evaluation and Adjustment: Academic plans should be continually evaluated and adjusted throughout their academic life span. Interim reports provide a cumulative record of information that can be used at different points to review and evaluate the program's development, beginning with a four-year process to document one full cohort. Evaluation of academic plans ensures that curriculum designers establish and meet goals at multiple levels (such as class, course, program, university mission, industry relationships, accreditation) and address multiple stakeholder perspectives (e.g., students, instructors, administrators, industry partners, researchers, employers).

2. Early-stage Clarification of Design Aims: The evaluation process began by summarizing the conceptual language and models that were initially used to design the academic plan. Stakeholders will be able to use the plan to compare and contrast their understanding of the aims of the curriculum and the evolution of theory in practice. It can also serve as a resource for reflecting on the differences between the curriculum's design and stakeholders' own individualized intellectual curricular experiences and interests. Finally, it can serve as a resource for generating dialogue about future interactions that faculty and staff would like to have with experts outside of CDP who can potentially help them expand the capacity of the program.

3. Communication and Community Building: The ability to communicate across differences is critical to the success of any academic plan as it opens up opportunities for building capacity. It also invites change and debate, which can be a healthy way of uncovering assumptions surrounding the intent and aims of the curriculum. In turn, these assumptions can then be brought into dialogue with other stakeholders and amendments can be made.

4. Intermittent Orientation and Inclusivity: Documented evaluation provides new members of the academic community with a resource for orienting their involvement with the program's aims and history. It also serves as an evaluation tool by providing stakeholders with a document that they can use to critically reflect on their own assumptions about the academic plan.

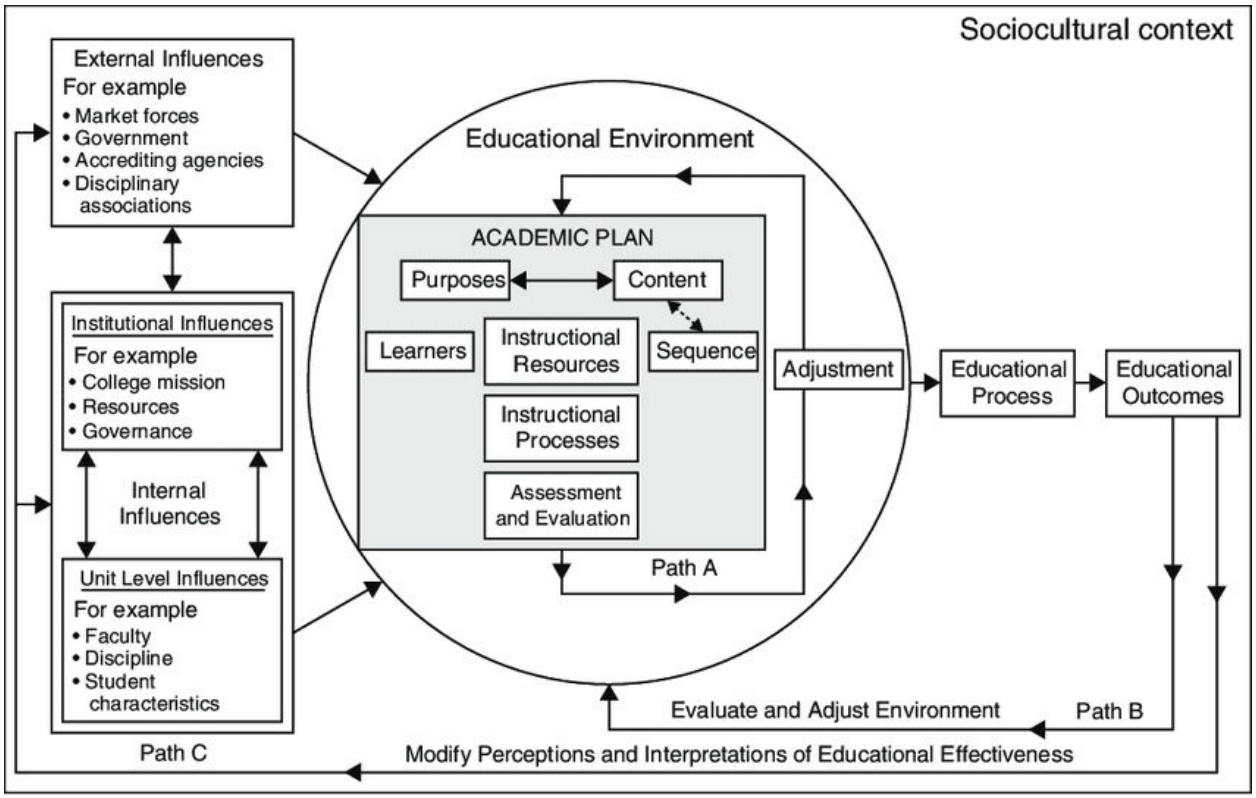
5. External Capacity Building: As external stakeholders interact with faculty, staff and students, evaluation reports can provide a holistic orientation to the aims of the program and clarify where and how they will be involved in the program.

6. Professional and Curricular Development: Continuous evaluation that includes stakeholders will yield insights that provide a meta-perspective for identifying strategies for ensuring that

resources are made available to faculty and staff so that they can explore new ideas and foster intellectual debate within the program.

Using the Academic Planning Model for Learning and Evaluation

Lattuca & Stark's academic planning model enables evaluators and curriculum designers to view an educational program as an activity system within a sociocultural context. In contrast to many approaches, it highlights complexity and integrative nature of multiple components, which makes it well-suited to the CDP. It is a "definitional framework" that helps educators deconstruct, analyze, and link components and perspectives within a system. With a focus on relationships between components, it provides points for reflective practice and intentional decision-making.



The evaluation plan begins with describing the foundational sociocultural context that informs the design and implementation of the CDP. The components of the academic planning model are then used to identify decision points.

Sociocultural Context

The CDP is part of the Honors College at Virginia Tech, a state land-grant university historically established as an Agricultural & Mechanical school. Later, the University nominally shifted to a liberal arts mission while remaining primarily identified as an engineering research institution. This legacy poses both strengths and challenges as the program designers develop a transdisciplinary curriculum that centralizes Integrative Professional and Personal Knowledge. Within the past five years, the University has navigated a shift toward transdisciplinarity under the banner of "Beyond Boundaries" and amidst three change initiatives: a "pathways" general education design, a capacity-building plan to

construct thematic, multi-disciplinary "Destination Areas," and the adoption of a decentralized "Partnership for an Incentive-Based Budget" (PIBB) model.

Transdisciplinary Goals. The "Beyond Boundaries" vision is an umbrella for multiple initiatives, including the Destination Areas, Virginia Tech's strategic planning efforts, and various inclusion and diversity initiatives. As described on the University's website:

> Beyond Boundaries is the foundation for a vision for Virginia Tech a generation into the future. A vision that reinforces the university's core values and established strengths, while considering two interrelated goals; advancing Virginia Tech as an internationally-recognized, global land-grant and strategically addressing the challenges and opportunities presented by the changing landscape of higher education. (beyondboundaries.vt.edu)

The Destination Areas initiative is organized around nine transdisciplinary stakeholder groups that are charged with building capacity around thematic areas of strength at Virginia Tech. This program was designed to promote transdisciplinary principles for cultivating research and curricular collaborations.[1] The nine stakeholder groups are:

- Adaptive Brain and Behavior (ABB)
- Creativity + Innovation (C+I)
- Data and Decisions (DD)
- Economical Sustainability and Materials (ESM)
- Equity and Social Disparity in the Human Condition (ESDHC)
- Global Systems Science (GSS)
- Integrated Security (IS)
- Intelligent Infrastructure for Human-Centered Communities (IIHCC)
- Policy

The organizational structure of the majority of the Destination Areas curriculum falls under Virginia Tech's Pathway Minor initiative, which is led by the Office of Undergraduate Affairs. The Destination Area Pathways curricula enable students to satisfy general education requirements while pursuing articulated interdisciplinary minors, such as:

- Innovation Pathway Minor, housed in the Department of Engineering Education
- Data and Decisions Pathway Minor, housed in the Academy of Integrated Science
- Materials and Society Pathway Minor, housed in the Department of Chemistry

Diversity and inclusion at Virginia Tech and Beyond. The CDP's academic plan is designed to recruit a diverse body of students and introduce them to modes of learning and collaboration that will prepare them to work in an increasingly transdisciplinary workforce. In pursuing these aims the program reflects Virginia Tech's *Beyond Boundary* vision[2] to:

- Cultivate global citizens by enhancing international engagement on our existing campuses and viewing the world as our extended campus.

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[1] The Destination Areas initiative is supported by the Vice Provost Office for Learning Systems Innovation and Effectiveness (LSIE). Information about the initiative, upcoming events and initiatives, as well as more details about each group's thematic can be found at: https://www.provost.vt.edu/destination_areas.html.

[2] Further information on the Beyond Boundaries Vision can be accessed: https://beyondboundaries.vt.edu/index.html

- Leverage new technologies so that students may share international experiences with one another.
- Understand difference through inclusion, the presence and practice of the arts, and the human-centered approaches to learning.
- Engage with diverse cultures by strategically advancing global engagement hubs.

The recruitment of students from diverse backgrounds is a concern for honors colleges across the U.S. As Janice Rye Kinghorn and Whitney Womack Smith argue, "developing honors programs that fully embrace nontraditional students is one of the central challenges the honors community faces in the twenty-first century" (2013, p. 16). However, the literature on diversity and inclusion in honors college programs is quite small, and there appears to be few schematics/metrics for developing evaluation strategies that examine how diversity and inclusion figure into the development of an honors college academic plan.

A number of scholars have outlined best practices and described the need for further research on diversity and inclusion in honors colleges. For instance, the literature that was reviewed for this report largely identified the need to increase minority student involvement and broaden participatory frameworks within existing programs for honors students so that they can develop deeper understandings of diversity. In the edited volume *Diversity, Equity and Inclusion in Honors Education*, a series of case studies explore inclusion topics, ranging from issues concerning recruitment (Stacey & Kelber-Kaye, 2018) to cross-cultural thinking (Posey, 2018). Stephen C. Scott provides a post-honors college analysis for readers seeking to "understand how to effectively foster Black students' curiosity in honors" (2017, p. 110). There is also a newly formed national organization, National Society for Minorities in Honors Colleges (NSFMH). Founded in 2015, the group maintains a listserv and holds a yearly conference (http://www.nsfmih.org/).

A key objective of the evaluation plan is to outline a set of questions for developing evaluation strategies for fostering and supporting diversity in all its varied forms within the CDP curriculum. Taking a holistic approach to diversity is key. By taking this approach, the research informing this report seeks to contribute to a gap in the literature. As William A. Ashton writes: "Focusing on 'student diversity' in an honors program's recruitment will be unlikely to lead to an atmosphere of accountability" (2009, p. 66).

As university policies mature, it may be necessary to adjust the program to build on these changes or broaden participation in these initiatives. It is also likely that these initiatives will benefit from the curricular work being developed in the CDP and want to identify strategies for building community with the CDP. To this end, the evaluation plan seeks to begin anticipating who, when, and how these issues can be accounted for in order to situate the CDP program in the most optimal set of relationships among the wider campus community.

Decision Points

How should academic plans be evaluated? The development and management of academic plans should be designed in a way that invites continual adjustments to the plan. The reason why this is important is twofold: 1) academic plans are designed around perceived social needs; and 2) academic plans provide shared understandings across contexts and social groups (Lattuca & Stark, 2009).

The initial conceptual designers of the CDP drew from models of other transdisciplinary programs as well as input from the sponsor and other business stakeholders. Also influential were external

educational initiatives that reference the future of work, the future of technology, and the future of learning, which are themes being jointly explored and presented by a cadre of university and external stakeholders in the current publication to which this example is appended. Various source materials informed the types of classes and organizing principles – like Studio+ and the Industry 4.0 quadrant. Institutional models included Olin College (Miller 2016, 2017) and Stanford's d.school, and theoretical influences ranged across educational thinkers and curricular models.[3] Based on interviews with instructors and other stakeholders, it was not surprising to find that not everyone involved in the curriculum design and implementation was well-read in these areas or shared understanding of how theoretical frameworks apply to the curriculum. However, throughout the first year of implementing the CDP with its first cohort, the frameworks aligned with Industry 4.0 were increasingly woven into discussions. In particular, the CDP director worked with the core faculty to cohesively connect program goals, learning outcomes, and instructional processes and align the CDP program with concepts of Industry 4.0 and Collective Autonomy: "*Developing workforce skills in collaborative technology innovation for societal impact.*"

Several program components were identified as areas to focus on for improvement. The examples described below are linked to program goals that must align with both the CDP conceptual design as well as the institutional mission and structures.

Program Goal (Transdisciplinarity): CDP faculty and administrators will ensure that technology and non-technology learning outcomes are balanced within the CDP and attainable in concert with broader institutional standards and goals. The CDP approach holds that learning occurs at multiple points along a process-outcome continuum, with process skills emphasized in high level, domain-general abilities such as communication and systems thinking, while outcomes are emphasized in attaining domain-specific skills such as programming. The CDP is being designed to graduate students who are adept in high-level skills and know how to recognize and address needs for domain-specific skills.

Evaluation Goal: Track connectivity between elements of the CDP curriculum as mapped to the concept of Integrated Personal and Professional Knowledge. Analyze effectiveness of tools such as the curriculum matrix and associated components in terms of usability, accuracy, implementation, and development (revisions).

- In progress Summer 2020: Faculty are creating a curriculum matrix that describes each module by quadrant area, knowledge level, skill level, and connectivity with the requirement that each module has more than one connection to other components in the program. Also, each one-credit module has a Pathway designation. (17 Desirability (all Novice except Year 2 Studio), 11 Sustainability, 11 Feasibility (5 Novice, 3 Capable, 3 Skilled), 11 Viability (9 Novice, 2 Capable), (4 Novice, 6 Capable, 1 Skilled)).

[3] Education theory influences*:* AAC&U Integrative Learning Model; Activity Theory; Bloom's Taxonomy; Davis, Brent and Dennis Sumara 2006. Complexity and Education: Inquiries into learning, teaching and research. New York, NY: Routledge; Hutchins, Edwin 1995. Cognition in the Wild. Cambridge, MA: MIT Press; Simon, Herbert 1970. The Science of the Artificial. MIT Press; Nicolescu, Basarab 2001. La transdisciplinarite´: manifeste. Editions du Rocher, Paris, 1996; English trsl. by K-C. Voss, Manifesto of Transdisciplinarity. State University of New York Press; Page, Scott E. 2008. The Difference: How the power of diversity creates better groups, Firms, Schools and Societies [New Edition]. Princeton, NJ: Princeton University Press; Rikakis, Thanassis, Aisling Kelliher, Jia-Bin Huang, and Hari Sundaram 2018. Progressive Cyber-human Intelligence for Social Good. Interactions. 25 (4): 52-56. Accessible at:
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- In progress Summer 2020: Faculty are revising modules to:
    - connect domain-specific and domain-general skill levels.
    - target skill levels on a scale of Novice, Capable, and Skilled.
    - connect to other modules, the Industry 4.0 workcells, tutorials, Pathway Areas, CDP Studio, and Honors Studio+. Need to address student understanding and motivation/buy-in for completing modules and tutorials, especially in terms of attitudes toward these courses that overlap with Pathways courses and courses for which they have earned credit (e.g., AP credit, etc.).
    - promote transdisciplinary levels of learning by including multiple components of the Quadrant tool. Students will connect knowledge at least at novice levels for all 4 quadrants before sophomore studio.
- In progress Summer 2020: Faculty are determining tutorial topics, addition of material to modules, and plans for adjustments during Fall 2020.
    - How will this additional workload of creating tutorials affect faculty?

Program Goal (Collective Intelligence/Autonomy): CDP graduates will be prepared to enter the workforce as strong collaborators who are able to recognize and address knowledge needs. The CDP will offer opportunities for industry partners to observe, work with, and hire students/student teams with information about their demonstrated team abilities. Students will be skilled to work in productive teams early in the curriculum, potentially resulting in ideas/projects of interest to industry partners.

Evaluation Goal: Measure how effectively students prepare themselves for project teams in Studio and workcells (teaming behaviors, participation in critiques, selection of modules and tutorials, selection of work cells). Explore how satisfied industry, non-profit, and research partners are in working with student teams.

- In progress (beginning Fall 2020): Industry 4.0 Workcells will be integrated into CDP and Studio+ curricula.
- In progress Summer 2020: Faculty writing brief workcell overviews of 6 workcells to share with industry partners (Spg/Smr 2020).
    - Designed so that students can and should participate in more than one workcell.
    - Each of the 4 quadrants will be covered by a common theme in all workcells.
        - Completed: Learning outcome language made consistent across all 6 workcell descriptions.
        - *Follow-up:* Clarify how workcells interrelate (via "neighboring cells").
        - *Follow-up:* Create mechanism for coordinating VT faculty members and industry partners.

Challenge (Adaptive Lifelong Learning (ALL)): All participants in the CDP, including embedded industry and non-profit partners, will offer and gain learning through a Community of Practice that includes multiple disciplines and skill levels, increasing diversity of knowledge and identity by pulling in participation from the edges to the center.

Evaluation Goal: Track ways that the program fosters ALL in students and other stakeholders through participation in Communities of Practice. Explore whether ALL opportunities can be built into all the modules, studios, work cells, informal activities, peer mentoring. Collect input from advisors and students and track revision history.

- Industry partners will continue to participate in CDP Studio and Studio+ projects.
- Industry 4.0 Workcells will provide spaces and projects that tie together students, faculty, researchers, and industry and non-profit partners across CDP curricula and Honors Studio+.

        - In progress: “novice” workcell work will be introduced in first-year, beginning Fall 2020. Find ways to integrate Fall 2019 cohort, which did not have opportunity to participate in workcells.
- Cultural Agility and Diversity will be addressed by contextualizing projects in terms of societal impacts.
    - How is diversity defined and embedded in practices in CDP?
        - People (e.g., gender, race, etc.) - summarize admissions, retention data (Michelle)
        - Set goal of 500 Honors-eligible students by 2022.
        - Track capacity and use of spaces (e.g., CDP Studio, Studio+, work cells)
    - What are the expectations for different participants? How do they vary by group? Partners will include industry, non-profit, VT research labs, CDP and other Honors faculty, students).

Challenge (Communication): CDP faculty and administrators will establish ways to communicate these goals and expectations to students and other stakeholders in ways that strongly value all skills and disciplines. The evaluation and faculty teams have identified several communication vehicles (listed below).

Evaluation Goal: Measure how often communication opportunities and tools are used, in what ways, and by which participants.

- Workcell Overviews - This document, targetted to an audience of existing and potential industry partners, is near completion.
- Point-of-Need Tutorials - Individual learning (adaptive learning) will take place via point-of-need tutorials that encourage students to build their skillsets in ways targeted to preferred workcells.
- Curriculum Matrix - clearly outlines details of curricular components and can serve as an advising tool. As an advising tool, the matrix will help faculty and students map their learning pathways and build the skill of *lifelong* adaptive learning.
- Course management platforms for modules will be open to all CDP faculty in “consultant” roles in order to enhance collaboration between faculty.
- Glossary - lists terminology, acronyms, and other instances of languages particular to the CDP. This will help newcomers learn about the CDP and participants reflect on goals and implementation.
- Lectures and discussions to introduce concepts central to CDP, e.g., Adaptive Lifelong Learning, Collective Intelligence, Community of Practice, Transdisciplinarity. IPPD (next section/appendix).
- CDP resources to connect studio, modules, and “in-between conditioning”/PoN tutorials
    - Critiques - consider including module instructors and Honors faculty in order to strengthen transfer between knowledge and skill areas
    - Asynchronous delivery of modules - will continue to move toward asynchronous delivery to enable people to learn different things at different times. Will there still be a hybrid approach by some instructors? How will variability in delivery modes be justified and explained?
    - Studio community between studios - How do we establish/communicate culture so that students know to participate in community?
        - Response in Spring 2020: open mic lunches, mentors for maker projects.
        - Should check-ins with mentors be required?
        - Will portfolios be required (and in what format)?

- Community interactions: Orientation, videos posted online, use posters as communication device, engagement component added to assessment protocols, authorship/co-creation by students in projects
- Community Cohesion and Curriculum Integration
    - Use of physical spaces, physical presence of instructors, students, partners
    - CDP, Honors Program, Studio+, Super Studio, Presidential Global Scholars - Do these communities interact? Are the work cells the primary overlap? Are there others?
    - How should the CDP, Studio+, and the general Honors Program students be integrated?
    - Within CDP, how will cohorts interact, especially since the 2019 cohort was prepared in the first year differently than the 2020 cohort?

Deliverables/Evaluation Plan for 2020-21

Transdisciplinarity/Integrative Personal and Professional Knowledge
Evaluation Goal: Track connectivity between elements of the CDP curriculum as mapped to the concept of Integrated Personal and Professional Knowledge. Analyze effectiveness of tools such as the curriculum matrix and associated components in terms of usability, accuracy, implementation, and development (revisions).

Collective Intelligence/Autonomy
Evaluation Goal: Measure how effectively students prepare themselves for project teams in Studio and workcells (teaming behaviors, participation in critiques, selection of modules and tutorials, selection of work cells). Explore how satisfied industry, non-profit, and research partners are in working with student teams.

Adaptive Lifelong Learning (ALL)
Evaluation Goal: Track ways that the program fosters ALL in students and other stakeholders through participation in Communities of Practice. Explore whether ALL opportunities can be built into all the modules, studios, work cells, informal activities, peer mentoring. Collect input from advisors and students and track revision history.

Communication
Evaluation Goal: Measure how often each communication opportunity is used, in what ways, and by which participants.

- 2019 Summary and 2020 Plan for end of Appendix A
- Appendix B - IPPD as example of CoP/participatory model
- Glossary of terminology + Acronyms
- Inventory of tools used in the CDP (e.g., matrices, advising tools, Industry 4.0 Lab/work cell overview), including iterative versions, revisions made, and how communicated to different stakeholders.
- Customized formative and summative course evaluation instruments
- Cognitive model of stakeholders and information flow. (for Appendix A) Connections between CDP components
    - Stakeholder perspectives
    - Gaps, overlaps, bottlenecks

    - With learning goals in IPPD model
- Recommendations for adjustments related to items in Reflection Points
- Tutorials and modules
- Perspectives from stakeholders (industry/non-profit partners, students, CDP staff, VT researchers) on points of value/adjustment, experience as workcell mentors and learners
- Descriptive overviews of various faculty roles (Studio, work cell lead, advisor, mentor, ...)
- Alignment between theoretical frameworks/models and CDP practices, esp. for 2021 pub

Concerns:

- Impacts and opportunities of COVID-19 adjustments...
- Is the program fostering ALL in students? How? Could this be built into all the modules, studios, informal activities, peer mentoring?
- Additional workload for faculty to create tutorials? (will discuss in August)
- 2019 cohort prepared differently than 2020 cohort
- Use sheet for advising and align module and tutorial development with info in sheet
- Communicating systems thinking and collective intelligence goals
- Communicating with other departments/advisors?
- Portfolio?
- Informal learning
- 2019 cohort prepared differently than 2020 cohort

Next Steps

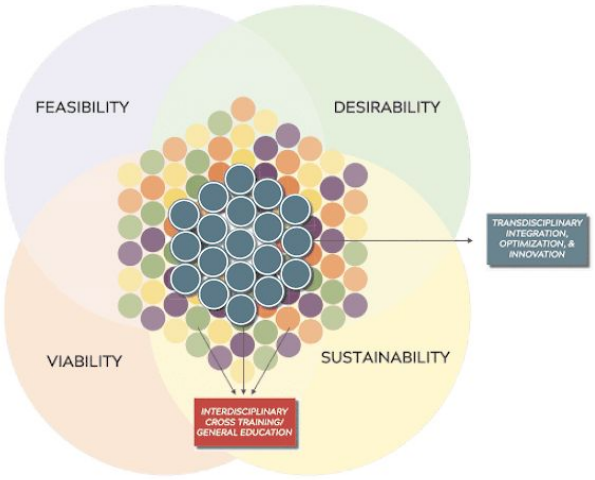
As the CDP has evolved toward the model of the Industry 4.0 Lab and increasingly embeds industry partners and coordinating research faculty in a community of practice, a number of structural features in the Academic Planning model will be reexamined. In terms of theory, the combination of Communities of Practice and the Integrative Professional and Personal Development Model (IPPD) also necessitates reconfiguration of the sociocultural context for evaluation.

Appendix B examines the Integrative Professional and Personal Development Model (IPPD) as a framework for “knowledge in action” that constitutes a core goal of the CDP. This personal and relational approach to learning integrates

- Life Skills and Personal Fulfillment
- Domain-General Skills (highly transferable skills and abstract concepts)
- Domain-Specific Skills (specialized knowledge and related task performance)

In tandem with the perspective of curriculum design as Academic Planning, the CDP expands the undergraduate learning environment to a Community of Practice that incorporates participants typically seen as “External Influences.” Going forward, the space of the CDP’s Educational Environment is expanded to embed formerly External Influences such as industry/market forces, which in turn shifts the ways in which the evaluative process seeks to “Modify Perceptions and Interpretations of Educational Effectiveness” (Path C in the APM), potentially taking on a cooperative mode. The reflection points of the Academic Planning Model are still useful for exploring how this expanded Educational Environment will be adjusted to align with Community of Practice and IPPD models.

Collective Intelligence



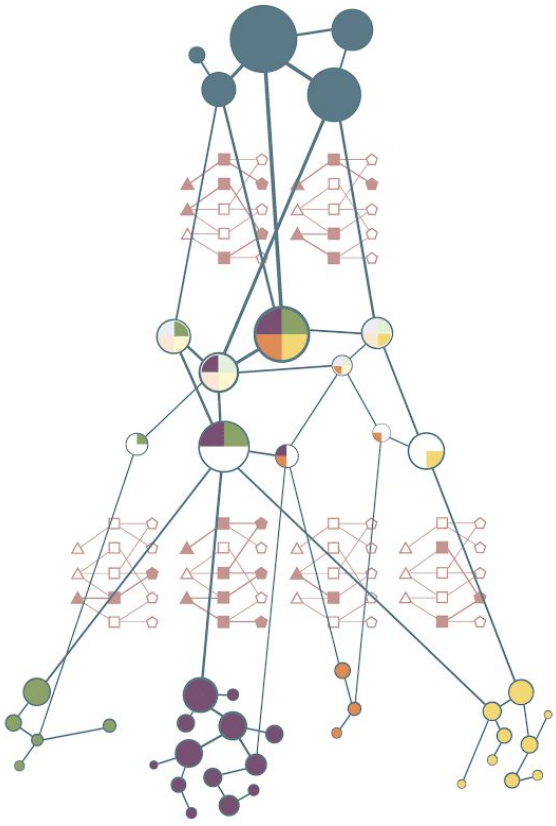
Life Skills

Collaboration
Communication
Reflection and Self Discovery
Agility in Complexity
Creativity
Leveraging Diversity

Domain General Skills

Systems Thinking
- Feasibility
- Viability
- Desireability
- Sustainability

Discourse
Society and Human Experience
Quantitative Thinking
Design Thinking



Domain Specific Skills

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ORPHANS (deleted text)

Glossary:

- "Chapters" - Novel but not immediately clear way to segment semester. Students adopted it fully but not immediately.
- "CEO" - Used to motivate and elevate visits by business partners. Also introduces complex hierarchical elements.
- "Advisors," "mentors" - How do these labels translate in the CDP and across departments? This language is important because it invokes relationships. Related concern: Michelle is meeting with advisors in other departments and establishing organizational trust. How are these roles being communicated to new students and their home departments? As advisors, do they sign forms, etc.? What do we call the industry partner mentors? What will the research lab leads be called?
- "Societal Impact" - How is this central tenet of the program being actualized and communicated?
- "not-for-profit" - How is this concept being clarified in relation to for-profit business?
- Discipline-related terms, like **"technology/electronics"** - What connotations do these words have for students, faculty, business partners across fields? What connotations does the CDP wish to promote? **"Policy"** - This word came up a lot in discussions with students. How is it embedded as a term and as a concept in the curriculum? **"Communication"** - This discipline is embedded in the program curriculum, especially the modules, but not robustly represented in student majors. It is more implicit in the studio critique processes. Is this an area to frame more intentionally?
- "Industry 4.0 and Collective Autonomy" - How is this initiative being communicated to students? How will CDP and Studio+ intersect? This is an area to be clear about in terms of the relationships between different parts of the Honors College.
- "Fragmented identities" - what do students want to do/be? Which concepts are we apparent about? Which are implicit?
-

Reflection Points (Components in Lattuca's model that help us identify areas to monitor and adjust)

External Influences (as shifting to embedded in Educational Environment)
Institutional Influences (scale-up plan - Studio+, Beyond Boundaries, ALL)
Unit Influences (as participatory in program and curricular design)

Educational Environment

- **Purposes** (knowledge, skills, and attitudes to be learned):
  - Adaptive Lifelong Learning for an Inclusive Knowledge Economy
  - Cross-Sector Integrative Personal and Professional Knowledge Development
  - Industry 4.0 connected with ALL
  - Point of Need learning
  - Technological Innovation for Societal Impact
  - *Knowledge in action*
  - Collective intelligence

- **Content**: (subject matter selected to convey specific knowledge, skills, and attitudes): The systems thinking quadrant serves as central teaching and learning framework and structural connector for content and delivery components. Faculty categorized modules by quadrant

section, skill level, and connection to other components in spring 2020 prior to revising (?) modules during summer.
    - life skills
    - domain-general skills (figure 2)
    - domain-specific skills (some modules, tutorials, workcells)
    - Systems Thinking - feasibility, viability, desirability, sustainability
- **Sequence** (an arrangement of the subject matter and experiences intended to lead to specific outcomes for learners). All students take Studio and some required modules with their cohort; Workcells, Modules, and Tutorials selected on basis of major discipline and preferred project area. This system relies heavily on advising and clearly communicating both content options and domain-general skill/program learning goals of systems thinking and collective intelligence. Learning environments and connections include:
    - Studio - domain-general skills, 4 quadrants
    - Workcells - domain-general, domain-specific skills, 4 quadrants. Industry mentors, CDP faculty, research/coordinating faculty.
    - Modules - include domain-specific skills and components of 4 quadrants. Serve as links between domain-specific skills and studio.
    - Pathways - General Education requirements. Modules assigned Pathways designations via governance, Fall 2019.
    - Tutorials - domain-specific skills, also approach for self-education for collective intelligence. Will be developed Fall 2020.
    - Informal learning - life skills. Examples include open mic lunches, networking after critiques/industry visits, participation in ALL meeting, etc. Concern: In Year 1, open to all and dropped into schedules. How do these events connect to formal learning components such as industry visits to Studio, critiques, workcell projects, cohort-to-cohort mentoring? These will also need to be adjusted in 2020 due to the size of combined cohorts and social distancing requirements.
- **Learners** (how the plan addresses specific groups of learners). The Community of Practice framework expands the notion of learners to include members other than students, even experts such as industry partners, instructors, research faculty, etc. How do students evolve within CoPs? How does the educational environment support all participants' strengths and aspirations? How is a CoP balanced taking into account both genuine hierarchies and aspiration of adaptive lifelong learning? Great set of questions at beginning of Ch 2.
    - Cohort 1 (Fall 2019 - Spring 2023)
    - Cohort 2 (Fall 2020 - Spring 2024)
    - Industry Partners
    - CDP faculty and instructors
    - Honors faculty
    - Coordinating (research) Faculty in Workcells
- **Instructional Processes**: the instructional activities by which learning may be achieved
    - Teaming
    - Critiques
    - Interactions with industry mentors
    - Interactions with advisors
    - Interactions with mentors
    - Workcell projects at novice and capable (Y1&2) levels (how to observe, collect data? What are objectives, goals within workcells and connecting across to other components of the CDP?)

- **Instructional Resources**: the materials, settings, services, and people that support the learning process
  - Studio in Hillcrest
  - Hillcrest equipment/lab
  - Industry 4.0 Labs (=workcells?)
  - 4 quadrants
  - Matrix of workcells
  - Matrix of modules
  - Tutorials
  -
  - Infrastructure (051920 conversation about platforms)
- **Evaluation**: the strategies used to determine whether decisions about the elements of the academic plan are optimal
  - Observations (Lisa, Amy, Jake present when possible)
  - Formative assessment/feedback mechanisms for courses
  - Track use of tools, such as quadrants, matrices
  - Track evolution of practices related to established learning outcomes (in governance docs) and evolving program goals
  - Interviews and focus groups (with students, partners, instructors)
  - Institutional data (recruitment, enrollment, demographics, performance…)

- **Adjustment**: enhancements to the plan based on experience and evaluation. See "Decision Points" below for some adjustments currently in planning to be put in place Fall 2020.

■

Orphans (cut sections):

Recommendations

Faculty select reflection and decision points on staged basis of priority, with multiple perspectives/criteria:
Learner--adaptive lifelong learning, pedagogical practices, socialization
Disruptive innovation--challenging heteronormativity
Diversity--people, spaces, tools, organizational practices
Economics--commodities including students, scholarships, grades, degrees, workforce, industry partnerships
Mission alignment--societal impact, transdisciplinary - how not too engineering-centric?, role of Studio+
Integrative--internal/external, student cohorts, honors communities, modules-studio,
both short-term and long-term impacts

First ripple effect - studio plus, no modules, one project, soph-sr

Methods

An "external" evaluator assisted by a post-doctoral scholar or graduate student participates in activities of the program, including classes, social events, and meetings. Data collected include field notes and audio-recordings from these activities; interviews and focus groups with instructors, students, and industry partners; curricular materials; photos of physical space; and institutional data (e.g., evaluations, grades, drop-add rates). The data is analyzed using qualitative coding methods informed by activity theory and the adaptive lifelong learning framework emerging from Calhoun Center for Higher Education Innovation. The evaluator facilitates continuous improvement by providing data-based points for reflection and intentional decision-making that help curriculum designers create, apply, and maintain an academic plan.

Reflection Points

- **Purposes**: knowledge, skills, and attitudes to be learned
- **Content**: subject matter selected to convey specific knowledge, skills, and attitudes
- **Sequence**: an arrangement of the subject matter and experiences intended to lead to specific outcomes for learners
- **Learners**: how the plan will address a specific group of learners
- **Instructional Processes**: the instructional activities by which learning may be achieved
- **Instructional Resources**: the materials, settings, services, and people that support the learning process
- **Evaluation**: the strategies used to determine whether decisions about the elements of the academic plan are optimal
- **Adjustment**: enhancements to the plan based on experience and evaluation
-
- Social Learning (Ch 2). Education as socialization. How to socialize through higher level ideas - discussion of alternatives.
- CDP advancing conception of diversity and transdisciplinarity
- Framework through Center doc - Tannenbaum. How can it inform a more-focused assessment of program goals? E.g., tolerance of uncertainty, metacognition, self-regulation. Looks like Boeing Behaviors. Generalizable, life, deep specialization skills - Bethany helping write.

Decision Points

- General goals and aims of CDP program and Industry 4.0 and Collective Autonomy: "*Developing workforce skills in collaborative technology innovation for societal impact*"
    - *Faculty:* Believe the program is innovative and unique and believe that it has the potential to radically inspire curricular innovation at Virginia Tech, and possibly beyond
      "If this model works, it's going be brilliant, in the sense that general education is in fact integrated with professional training, which we've never done at Tech. We have always had: first, get [your required courses] out of the way; now [you can explore] your major, which is much more important."
    - *Students:* See program as innovative, as "real world", and as unique opportunity to work with important industry network.
    - *VT Research Partners:* no data
    - *Business Partners:* Opportunity to contribute to training of and access to dynamic workforce.
    - *Super Studio, Presidential Global Scholars:* no data

- Transdisciplinary student engagement with cohort(s), faculty, partners, and projects: studio, modules, and "conditioning"
  Critiques - consider including module instructors and Honors faculty in order to strengthen transfer between knowledge and skill areas

  "Completely online" modules? *Not really … several issues, related to socialization and transdisc/diversity.*
  - asynchronous delivery - should be the rule, not exception. People learn different things at different times. Still, doesn't give anyone more time necessarily.
  - still hybrid? Up to instructors, so need to clearly communicate. Also need a discourse platform.
  - Studio community between studios? Basketball...conditioning room. How do we establish/communicate culture so that students know to participate in community

  All Modules have 5 concept areas. Neat but negotiable - students learn to discuss with the instructor what they need/want. Co-creation paradigm. How to adapt module in way that is helpful - can help instructor structure content and student groups, help connect modules and studio work that students are doing, help students learn a critique approach based on creative process.

  First year students? Should they all meet in person at same place at the beginning?

  Internships/Opportunities with Partners

· Portfolios (in what form has this materialized?)
  - Co-Web
  - Access to all online stuff by all instructors

  Course taught by Jake?
· Diversity and inclusion
  - Identity politics vs. Multiplicity of perspectives
  - This will be related by some to those who drop out of program
  - Need diversity in instructor ranks→ Joanie, module instructors? *M: institutional data
· Partnership with external and not-for-profit partners
  - Shift away from not-for-profit? – how affects societal impact element of CDP? *New not-for-profit in Fall 2020.*
  - Relationships with new for-profit industries – how influencing direction of curriculum, hiring

  Black Rock - sustainability
  not-for-profit in the room

· Possible future issues of concern
  - Community cohesion without f2f classes or studio
  - Studio+

- Community through social
  - "Suspicion inside - I'm good at this system, but there's something else out there"

    - Honors College - policy
-

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