An Educational Framework to Promote Self-Authorship in Engineering Undergraduates

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To succeed in the twenty-first century workforce, technical knowledge alone is insufficient [1] - [5]. Today’s graduates must grapple with an uncertain future shaped by constant, rapid, and disruptive change. This requires that our students build their own self-concept, learn to develop meaningful and rewarding relationships, and mature their capacity for deep learning. These capacities are rarely explicitly cultivated in traditional engineering programs where modes and definitions of learning encourage dependence on the faculty member as authority.

In the Pavlis Honors College at Michigan Technological University, we have developed an educational framework based in psychologist Robert Kegan’s theory of adult development [6] to provide students with a foundation in the competencies needed to advance their ability to become flexible professionals and also balance their knowledge across the technical and social worlds. Kegan’s theory suggests that as individuals mature, they encounter disorienting dilemmas that cause them to question their world view. With sufficient support through these challenges, individuals develop their own sense of self rather than depending on external authorities to define who they are. They begin to shift their perspective from simply reacting to the world around them to examining themselves as objects operating within the world with autonomy and self-determination. Kegan categorizes this development shift from adolescence to adult as a shift from the socialized mind to the self-authoring mind. It is exactly this internal definition or self-authorship that provides individuals with the capacity to manage complexity, uncertainty and change—the world our students are entering. Typically, this shift to becoming self-authored occurs after graduation [7], however, given an appropriately designed learning environment [8], students can advance their capacity for self-authorship in their undergraduate years.

In this paper, we share an educational framework built on the theories of adult development self-authorship and self-determination, as well as our curriculum which is designed to build capacity for self-authorship in our students. We outline the innovations that this has introduced to our program including creating an honors program that does not use GPA or standardized test scores for admission or retention, but rather emphasizes immersive experiences and reflective practice that challenge students to develop their own internal voice and interpersonal relationships. We share our rubric for assessment of self-authorship using reflection assignments and offer case studies of engineering students who reveal increasing levels of self-authorship capacity and preparation as flexible professionals, ready to enter the rapidly changing world and engineering workforce.

Our Educational Framework (Theoretical Underpinnings and Curriculum)

Our educational framework is rooted in the theories of self-authorship and transformational learning. The concurrent development of students across cognitive, intrapersonal, and interpersonal domains is described by the theory of self-authorship. Baxter Magolda provides a succinct description of self-authorship as “the internal capacity for an individual to define one’s beliefs, identity and social relations” [7 p. 269]. This theory is rooted in the work of Kegan [6], who argues that this development is a necessary foundation for individuals to meet the expectations of adulthood; this claim is supported by Baxter Magolda’s 21-year longitudinal
study of young adults age 18 to 39 [9]. In this study, she found that participants’ roles and responsibilities required them to analyze data, explore and evaluate diverse perspectives, understand context and others’ frames of reference, and negotiate competing interests; each of these steps is useful for weighing alternatives and arriving at a judgment. Executing these tasks requires self-authorship to ensure that individuals are not overwhelmed by external influence, are confident in their ability to make defensible decisions, and are able to collaborate productively with colleagues.

Self-authorship requires the individual to shift from uncritically depending on external authorities for values, beliefs, identities, and loyalties to defining these elements internally. Individuals develop self-authorship when they are encouraged to construct and explain their views in learning environments that provide opportunities to explore alternative interpretations and that are emotionally supportive of the challenges of the knowledge-construction process [9] [6] [10]. The levels of self-authorship are diagrammed in Figure 1. In the movement from External Formulas to entering the Crossroads, individuals begin to experience and respond to tensions associated with continued reliance on external formulas as a means of defining themselves, their relationships, and their beliefs. As the individual moves into the Crossroads, they more openly question external authorities and begin to construct, listen to, and cultivate their internal voice. Once Self-Authored and ultimately Internally Defined, the individual trusts the internal voice, builds upon that foundation and becomes secure in their identities, relationships, and beliefs. It is important to note that the development of self-authorship is not a linear experience and that the course of development rarely unfolds smoothly from one level or way of making meaning to the next. Rather, the developmental trajectory is punctuated with meanders, sprints, and setbacks. Nevertheless, there are identifiable discernable milestones.

<table>
<thead>
<tr>
<th>Dimensions of Self-Authorship</th>
<th>Phases of Self-Authorship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Development: How do I know?</td>
<td>Following Formulas</td>
</tr>
<tr>
<td>Interpersonal Development: Who am I?</td>
<td>Believe what &quot;authority&quot; believes</td>
</tr>
<tr>
<td>Interpersonal Development: How do I construct relationships?</td>
<td>Define self through external others</td>
</tr>
<tr>
<td>Approval seeking in relationships</td>
<td>See need for authenticity</td>
</tr>
</tbody>
</table>

Figure 1. Developmental stages of Self-Authorship (after [9]).

Without an intentional intervention, most undergraduate students — and even college graduates — define themselves through external formulas, rather than self-authoring their beliefs [11] - [15] [9] [6]. However, evidence shows that with appropriate support, this can be changed. There are several types of experiences that produce higher degrees of self-authorship among undergraduates [16] [17]. These include experiencing dissonance in academic settings, being challenged to evaluate knowledge claims and take ownership of beliefs, encountering diverse perspectives, and addressing tragedy or complex personal relationships. Also essential is the identification of a community of support where processing of these challenging experiences
occurs. Unfortunately, this demand often occurs post-graduation, leaving individuals to face significant challenges with insufficient preparation and potential risk to themselves, the people around them, and the organizations and systems they are trying to improve [18]. To account for this in an academic setting and to develop self-authorship, a supportive environment can be created through a Learning Partnership Model [19].

The Learning Partnership Model [8] is an outgrowth of the theory of self-authorship, designed as a practical approach to transform both curricular and co-curricular learning. To empower individuals to explore the complex landscape of knowledge, identities, and relationships, the Learning Partnership Model incorporates three key principles:

- Validating learners as knowers: Ensure students know their voices are important and encourage them to share ideas and viewpoints, while muting the voice of faculty as “the” authority, thus helping students to see the instructor as human, approachable, and concerned;

- Situating learning in learner’s own experience: Recognize and acknowledge that students bring their personal experiences into the classroom, explain the relevance of material to students’ daily lives, avoid marginalizing students, and provide opportunities for self-reflection to help students become clearer about what they know, why they hold their beliefs, and how they want to act on them; and

- Defining learning as mutually constructing meaning: Frame learning as something you experience together when both the instructor and the student share their perspectives; students see that the instructor is continuing to learn through their work together and demonstrates lifelong learning.

The key to a successful Learning Partnership is the balance of challenge and support necessary to push students towards self-authorship without triggering a reliance on old ways of constructing identity, relationships, and knowledge. Educators and administrators have used this model to design effective learning partnerships for learners in many situations (e.g. orientation programs, undergraduate courses, internships – detailed examples can be found in Taylor, Haynes, & Baxter Magolda [20]); however, there is little evidence based on using this model in the undergraduate STEM educational setting.

The Pavlis Honors College has applied the Learning Partnership Model in a STEM-dominant research university to encourage the development of self-authorship of our students. The Pavlis Honors College is deliberately positioned as an independent, interdisciplinary college that redefines “honors” in terms of self-authorship. PHC has a distinctive design: the college is open to any student on campus regardless of GPA or other traditional metrics, creating a welcoming and inclusive program that challenges prior conceptions of honors education. The removal of external motivators, such as GPA, from academic requirements is a key design element of the college related to the goal of fostering an authentic internal voice, internal definition, and intrinsic motivation among participating students, stimulating their development of self-authorship and preparation for the 21st century workforce.
The program structure follows a tiered model of educational development associated with both the cognitive and affective domains of Bloom’s Taxonomy [21] [22] and self-authorship theory described above. The three tiers of the program are modeled after the work of Taylor and Haynes [23] and are shown in the left column of Figure 2. This program grants participants official honors status and recognition at graduation.

Figure 2. Diagram showing curricular and co-curricular elements of Pavlis Honors College Program.

The program integrates a Learning Partnership Model across a series of developmental seminars, a set of required co-curricular activities with structured reflection, and advising support such that students are fostering self-authorship: increasingly complex ways of making meaning about one’s identity, relationships and beliefs. Students collaborate with faculty during seminars to explore concepts related to personal and social identities, cultural maturity, empathy, mindfulness, collaboration, and communication via dialogue. Students also define an academic enhancement (e.g. minor, certification), an immersion experience in which they apply their skills and knowledge in a new and unfamiliar context (e.g. an internship, international experience), an honors project that reflects their learning and a leadership or mentorship activity. All program elements involve guided or semi-structured reflection with a PHC faculty member or advisor designed to provide the student a platform by which to reflect on their learning and make meaning of their experiences and to encourage the development of self-authorship. Table I provides a summary of the reflection requirements of each element of the program.
The reflective practice that forms the spine of the Pavlis Honors Program curriculum draws on Kolb’s Experiential Learning Cycle [24], which stresses the importance of reflection for growth and learning. Reflection forms a key step in connecting concrete experience to abstract conceptualization (which then connects to active experimentation, thence to concrete experience and so on). Also, inspired by service learning pedagogies [25], we continually ask our students to formulate plans for future action based on their experiences. In short, we ask students: “What? So What? Now What?”

### Methods

To explore student capacities for building their own self-concept, learning to develop meaningful and rewarding relationships, and maturing their capacity for deep learning, we relied on existing work for the development of self-authorship in the intrapersonal, interpersonal and cognitive domains, synthesized into a rubric (see Table III).

We selected four students who had completed our series of seminar courses, three of whom were engineering majors, to trace longitudinally, comparing their reflections at the end of the program to earlier work in their honors courses. We included a non-engineering STEM major in part to reflect our general cohort and in part to assess this approach to self-authorship in STEM more broadly, not just engineering. Table II provides a profile of each student using an assumed name to preserve anonymity. This small sample size is in part due to the age of our program: it is still in a state of growth and the upper seminars remain quite small. But we also sampled even a subsection of the already small class in order to showcase the distinctive voices and narratives of each student. Our main interest in this study was to look in depth at a few cases and how those articulate with our newly developed rubric.

### Table I. Pavlis Curriculum and Reflections

<table>
<thead>
<tr>
<th>Curriculum Component</th>
<th>Number/Frequency of Reflection(s)</th>
<th>Feedback - G (graded) C (comments) D (debriefed w/ mentor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar I (HON2150)</td>
<td>Weekly</td>
<td>G, C</td>
</tr>
<tr>
<td>Academic Enhancement</td>
<td>Proposal with justification (before)</td>
<td>C</td>
</tr>
<tr>
<td>Immersion Experience</td>
<td>Proposal with pre-reflection (before), 5 reflections over the course of the experience</td>
<td>C, D</td>
</tr>
<tr>
<td>Seminar II (HON3150)</td>
<td>Weekly</td>
<td>G, C</td>
</tr>
<tr>
<td>Honors Project</td>
<td>Proposal with justification (before), Final reflection</td>
<td>C, D</td>
</tr>
<tr>
<td>Seminar III (HON4150)</td>
<td>Weekly</td>
<td>G, C</td>
</tr>
<tr>
<td>Mentorship/Leadership Activity</td>
<td>Proposal with pre-reflection (before), 3 reflections over the course of the experience</td>
<td>C, D</td>
</tr>
</tbody>
</table>
Table II. Students selected for longitudinal assessment

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Gender</th>
<th>Major</th>
<th>Year of College when Enrolled in First Seminar</th>
<th>Year of College when Enrolled in Final Seminar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sophie</td>
<td>Female</td>
<td>Non-Engineering STEM Major</td>
<td>2nd Year</td>
<td>4th Year</td>
</tr>
<tr>
<td>Leo</td>
<td>Male</td>
<td>Engineering</td>
<td>2nd Year</td>
<td>4th Year</td>
</tr>
<tr>
<td>Esme</td>
<td>Female</td>
<td>Engineering</td>
<td>2nd Year</td>
<td>5th Year</td>
</tr>
<tr>
<td>Raymond</td>
<td>Male</td>
<td>Engineering</td>
<td>2nd Year</td>
<td>4th Year</td>
</tr>
</tbody>
</table>

We assembled reflections from each student at three points within the curriculum: at the beginning of the first seminar, representing the incoming student voice, at the end of the first seminar, a retrospective look over the semester, and at the end of the final seminar, a retrospective look over the program.

At the beginning of the first seminar, students were asked to write a reflection in the form of a letter to their future selves, “sharing [their] expectations for this course experience.” Three of the four students had a prompt that asked specific questions including, “Will this be the same as in your other courses? [...] Discuss how you see yourself fitting into this new Learning Community, thinking not only about your own contribution but also how you would like to interact with others within this Community, including your peers and your instructors.”

At the end of that first seminar students were asked to write reflections responding to that initial letter, “Go back and read that letter to yourself and then write a reflection about your experience through the lens of your expectations. [...] Share how this experience has affected the way you look at yourself, others, your education, your goals, and your success. Is there anything that you now look at or approach differently due to your experience in this course?” In addition, students were asked to write a letter to an incoming student about the first seminar experience.

At the end of the final seminar, students were given a copy of their initial reflection letter from their first seminar and asked to write “an overall (meta-) reflection on [their] experience.” They were asked to reflect, “Where you were when you came to the Pavlis Honors College, where you have been. In five years, what do you think you will remember about what you have learned in the honors college curriculum and what influence do you think it will have had on your life?”

The discussion below is a qualitative analysis of the three reflections for the four students. The responses are analyzed through the theoretical lenses of self-authorship theory and the learning partnership model, but also emergent properties in the responses are highlighted as we endeavor to give the students themselves space in this paper to tell their own stories of their experiences. Typos have been silently corrected without change of meaning. Table III shows a rubric developed for evaluation of self-authorship levels in written reflections. This rubric relies on aspects of self-authorship theory [26], social justice ally theory [27] and the reflective judgment model [28].
Table III. Rubric for evaluation of self-authorship levels in written reflections.

<table>
<thead>
<tr>
<th>Level</th>
<th>Characteristics of Student Written Reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Following Formulas</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Mid</strong></td>
<td>Knowledge comes from observation and authority. The student’s values and identities are solely formed through the influence of authority figures. Reflection is superficial, showing no critical analysis/questioning. Reflection voice is formal, lacking authenticity, seeking to please the reader.</td>
</tr>
<tr>
<td><strong>Advanced</strong></td>
<td>The student largely ignores cultural differences and leaves own values and identities unexamined. Knowledge comes from authority or what feels right to the student, aligning with currently held beliefs. Student’s values and identities are formed through the influence of authority figures. Reflection remains superficial, with justification of existing beliefs without examination or question.</td>
</tr>
<tr>
<td><strong>Crossroads</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Early</strong></td>
<td>The student mentions the roots of their values and identities. Cultural differences, or differences between identity groups are acknowledged, but how these differences influence people’s actions and ideas is largely unexplored (assuming everyone is equal in modern society, despite differences). Reflections show a slight move away from authority, revealing minimal exploration of new ideas.</td>
</tr>
<tr>
<td><strong>Mid</strong></td>
<td>The student engages in deeper analysis of identities and values, mentioning details of how they were formed and have changed. They still assume equality in modern society, but attempt to provide a rationale for why they feel that way. Reflections exhibit a larger distance from authority with student beginning to challenge the “sage on the stage” or other life influencers. All claims are assumed to be idiosyncratic to the individual - one cannot determine ultimate correctness with competing evidence. Reflections reveal questioning, but uncertainty in how to resolve conflicting beliefs.</td>
</tr>
<tr>
<td><strong>Advanced</strong></td>
<td>Though still reluctant to acknowledge differences between identity groups, student is more critical of the lenses through which they see race and culture. The student has seriously considered how their identity influences how they interact with the world around them. They exhibit a more developed reasoning behind their move away from authority. Knowledge is contextual and subjective and is justified through inquiry. Reflections reveal a maturity of authentic voice and a recognition that further inquiry is warranted regarding conflicting information.</td>
</tr>
<tr>
<td><strong>Self-Authorship</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Early</strong></td>
<td>The student begins to show understanding of the social construction of identity, seeks opportunities to engage with different others and begins to challenge inequality. The student sees engagement with different others as an opportunity to learn. The student reflection reveals attempts to constructs knowledge by seeking more information and context, acting to resolve the conflict through further inquiry.</td>
</tr>
<tr>
<td><strong>Mid</strong></td>
<td>The student exhibits an extremely high level of reflection on their own identities, the ways in which society constructs social identities, and the societal effect of this construction. The student shows awareness of their own method for constructing knowledge through inquiry. As an outcome of understanding, the student actively coordinates, seeks out, or participates in allyhood, leadership, and mentorship activities. This movement to action is reflected upon and firm plans are enacted.</td>
</tr>
</tbody>
</table>

**Discussion of Initial Reflections from First Seminar**

In their first reflections coming into their first seminar, students demonstrate awareness of general college formulas. One student gives herself the advice,

“pay specific attention to sessions that relate to career fair prep and what to do after you’ve gotten the job. This is completely new territory for you and it will be important information to help in your future career. Take advantage of resume writing tips, interview skills practice, and then, of course, what to do after the job offer is made. […] Then, be sure to apply these lessons to not only your internship search, but also in your personality and attitude toward college as a whole.” (Esme)
Esme looks to the course to give specific, practical advice that will slot neatly into her vision of her life. She seeks in the course an authority to give her knowledge (“lessons”) that she will “apply” directly in specific upcoming situations aligned with the typical accepted goal of seeking an internship, receiving a job offer, and getting a job.

Some students demonstrate following formulas in the language they use to describe their expectations:

“I expect to completely dedicate myself to the Pavlis program. In my Pavlis course, I expect to give nothing less than my best in order to ensure that I am making the most out of my Pavlis experience.” (Raymond)

This language suggests that the student is applying stock phrases that he thinks the instructors of an honors course want to hear. It is not likely that the student would physically be able “to completely dedicate” himself to the honors program on top of a demanding engineering major.

Indeed, most college classes reward following formulas. As they address the question of how this will differ from other college classes, students also reveal their expectations of their other classes:

“This Pavlis course is looking to be a completely different format than my other classes. My core classes focus on educational development through the study of specific material. In these courses, completing the homework and engaging in a little bit of out of class studying can allow me to succeed. On the other hand, this Pavlis course is structured such that it will focus more on the development of self, let it be enrichment in character or general scholastic habits, and community.” (Raymond)

Raymond asserts that he understands the methods for ensuring success in his “core” engineering classes. He sees a significant difference in the subject matter and approach to learning, although like Esme he characterizes some as being a matter of tips for improving “scholastic habits.”

Sophie focuses on the idea of the altered relationship between students, instructor and content:

“A large majority of the course content is left up to the students to decide, which is essentially flipped from how a class is typically structured where the instructor chooses the course material. Instead of class being about what we have to learn, it is about what we want to learn.” (Sophie)

The distinction between “hav[ing] to learn” and “want[ing] to learn” is telling, in part because other, required courses are not described as a matter of choice or desire. The instructor “chooses” content; the student is remarkably passive.

The fourth student admits to uncertainty, but still in the language of following formulas:

“I am puzzled as to what exactly we will be trying to accomplish throughout the program, what the final goals are, and the expectations they have for us. Throughout the course, I hope to gain a better understanding of the goals of the PHC and the expectations that they have for me as I move further into the program.” (Leo)
Leo seeks formulas to follow, authority from the class to tell him how to measure his own success. Note the repetition of seeking “expectations for” both “us” as a whole and “me” in particular. Again, following formulas may be aligned with these students’ expectations of what their college classes generally demand of them.

**Discussion of Final Reflections First Seminar**

In their final reflections for the first seminar, the students each reported growth and benefit from the program. Some of their self-reported growth maps onto the domains of self-authorship: cognitive, intrapersonal and interpersonal. Their reflections also comment on the distinction between the Pavlis course and their other courses.

All students discuss the interpersonal dimension of the class, valuing their relationships with their peers, many of whom they describe as “friends.” Frequently, their reflections on these relationships have to do with the extent to which the other students were both similar and different to themselves. This tension is typical of the crossroads: confronted with difference, students begin to understand the social construction of identities and values. Yet in the crossroads, often students stress the equality of viewpoints rather than challenging inequality, in early self-authorship. As they enter the crossroads, individuals begin to mention differences between identity groups and how they influence actions and ideas. In the early crossroads, individuals assume equality between viewpoints, but as they develop, they exhibit higher awareness of how knowledge is contextual, eventually actively constructing knowledge through directed inquiry (see Table III).

In describing the close friendships he has formed in his cohort, Leo stresses their similarity to himself. This statement derives from the letter to a (fictional) incoming student, hence the second person:

> “Some of the best people that I’ve ever met at Michigan Tech I have met from the honors college and from my seminar class. If you talk to others in the seminar I am confident that you will find they have goals at Michigan Tech and in life that are similar to your own.” (Leo)

Leo assumes that similarity is a self-evident good foundation for building friendships. In stressing the common goals that the classmates share, Leo emphasize the ways in which the students follow the formulas of the normative college experience. The course, then, continues for the moment to be framed as a means of getting students to the same goals, in college and in life, that they receive from “the influence of authority figures” (Table III, Following Formulas [both levels]).

Conversely, another student stresses the variety within the course:

> “how everyone would bring different ideas and backgrounds to the course to make it a unique and interesting place…. was one of my favorite things about the course. I have made so many new friends and connections throughout this course and have learned so much from those around me. I have learned about people’s backgrounds and stories and cultures and what makes each person unique and I always left class feeling like my world view had expanded in some way, even though I hadn’t even left campus.” (Sophie)
Sophie’s sense of virtual travel, of “expand[ing]” her “world view” indicates that she sees her fellow students as a gateway to other experiences and viewpoints. The differences among the students provokes a shift in her thinking, although she is still struggling to put that shift into words.

One student noted similarity to others in a sense of dawning crossroads thinking:

“This course has really changed my outlook on people as individuals. I guess I always thought of myself as a unique individual with a particular background and one of a kind culture. What I failed to do was recognize that other people had equally unique backgrounds, skillsets, and experiences that made them a completely different person than myself.” (Raymond)

In other words, Raymond recognizes others as complex as himself, yet distinct: a realization of the existence of multiple worldviews made up of different lived experiences. He further instrumentalizes this knowledge:

“Through all the talk we did on social identities, culture, and bias, I have now realized a better way to approach situations in which I may be faced with others who have different perspectives than me because of their background.” (Raymond)

This “now what” moment allows the student to put what he learns into practice. His notion that “different perspectives” stem from differences in “background” indicates the crossroads.

One student actually noted that the strong interpersonal bonds could hinder her self-expression and cultivation of an authentic voice:

“Each week, I grew much closer and closer with the people in the class to where I know everyone personally and some are friends of mine outside of the classroom. Yet, at times this also hindered my ability to give as much of myself as I could have. Though I knew and trusted the other students, I now felt I had to ‘keep up appearances’ so they would continue to like me. I wish I would have done a better job of ignoring this thought in my head.” (Esme)

Esme processed the class and its component individuals as another authority through which to define her identity. However, she recognizes this tendency toward approval-seeking (see Figure 1), demonstrating self-awareness, and her regret in self-censorship suggests a desire to modify further action. Another student noted in advice to an incoming student,

“it is crucial throughout the class that you do your reflections honestly and as a function of your current self. Do not just reflect on what you think the professors would like to hear, be yourself and write in your voice.” (Leo)

For this student, the development of an authentic voice in a reflective practice was essential. Yet the reflections at this stage of the program were only read by the instructor. In the final seminar, students reflected in group forums and commented on each other’s work.
In terms of cognitive and intrapersonal domains, some students reflected a shifting in the sense of self-knowledge, often acknowledging differing frames of reference. One student noted,

“I learned that I judge things a lot. Not just people but perspectives, ideas and methods.” (Leo)

Another student, in addressing an incoming student, urges,

“In Pavlis, you should definitely have expectations of what is to come. But always keep an eye on your expectations. Do not let them hinder you or keep you from fully emerging [sic] yourself in the Pavlis lifestyle. While you may occasionally be asked to participate in things that do not seem to align with your established expectations, many of the things you will be asked to do will come full circle. These things may shock you by fulfilling your expectations in ways you could not have imagined. It is in these times where your personal growth will be maximized.” (Raymond)

The notion of “keeping an eye on your expectations” suggests the beginnings of a subject-object shift: expectations become something that you have as opposed to something that you are. This student articulates the process of self-awareness and critical distance essential to the process of critical reflection.

Several students recalled moments that shook their frames of reference, or even presented disorienting dilemmas:

“Some of the activities and projects that we did in class were difficult because they required thinking deeply about my values, emotions, or background; others were difficult because they seemed obscure and I didn’t understand the purpose of the activity or what I would gain from it. I think that persevering through the activities that were difficult or didn’t make sense allowed me to gain a lot more from the course in the long run. One of my favorite sayings is that things that are worth it are never easy. I think this saying was very applicable to many parts of this course as we navigated and delved into what were often very difficult subjects.” (Sophie)

As in a learning partnership, the experience is reported as challenging but the environment as supportive.

Some students described the course as fundamentally different from their other classes:

“I have to admit this seminar class was much different than any other class I had ever taken before. It was not focused so much on teaching something as guiding you towards seeing what you want to do and who you want to become…the seminar class was my favorite class of the semester[.]” (Leo)

This excerpt intertwines the interpersonal and the intrapersonal as well as the notion of the development of the authentic voice and authentic self.

In addition, two students stated specifically that the course encouraged them to become more ambitious:
“my view of myself has definitely changed in terms of what I have learned about myself and my strengths & weaknesses. In accordance with my expectations of myself, I now see myself as someone capable of having a true impact on the university.” (Esme)

Leo talks about a class exercise helping him identify a desire for a career in public service such as a mayor or a governor. Throughout my life I have always had small spurts of inspiration where I have wanted to work towards this goal but I have always said to myself it is unrealistic and I could never obtain enough support or recognition for a job such as that. However, […] I had a realization that is something I am passionate about and want to do in life. I now believe that if I work towards it hard enough I can accomplish it. I think that my confidence also rose throughout the semester as a result of the program and an example of that boost is my increased confidence to pursue a passion I previously thought was unobtainable.” (Leo)

This increasing ambition is not a direct goal of the course, but it seems a beneficial effect. It may stem from students defining their own goals and values. As they take ownership over their goals, rather than receiving them from external authorities, students may formulate more ambitious goals—or express more enthusiasm for the ones they have. Leo reports a “boost” to his confidence in general. Perhaps that boost derives from expressing his authentic voice and having that voice validated by his peers and instructor.

**Discussion of Final Reflections from Final Seminar**

In their reflections at the end of the final required seminar, these students returned to the same letter they wrote themselves at the beginning of their first seminar, now 2 to 2.5 years later. These reflections are substantially different, both in their explicit content and in their scope and language. Students reflected on their overall PHC experience, but also on their college experience as a whole. These reflections demonstrate increased levels of self-authorship, especially as students describe how their views changed over the course of their college—and Pavlis—experience.

One student describes their growth explicitly in terms of the self-authorship framework, which the students studied as part of their seminar courses:

“When I came into the Pavlis Honors College my sophomore year, I was definitely occupying the socialized mind. Unfortunately, that is exactly where I was entering my freshman year of college. My first year at Michigan Tech did not provide me with opportunities to develop as a thinker. I was not given any support system to allow me to grow as an individual. Instead, I maintained the same sense of being I had through high school. In high school, I derived my entire sense of self-worth from external sources. Teachers told me I was bright and motivated. They told me I could accomplish great things. And while I believed that to be true, it was their expression of those principles that I drew my own affirmations from.” (Raymond)

In his initial college experience, Raymond continues,
“I wanted to get good grades, not because I thought it would make me successful in my career, but because I thought it was what my parents and mentors expected out of me.” (Raymond)

As he re-read his initial reflection from the first seminar, Raymond identifies this mindset in the writing:

“This behavior even found its way into my initial Pavlis reflection. I think by all grading metrics, my socialized mind status was evident in my writing. It’s difficult to ascertain if what I wrote in my initial reflection was genuine, or if I was just reciting the information, I had already been exposed to through the first class session. Nonetheless, I’ll proceed assuming that this reflection was my first step towards defining my own goals.” (Raymond)

Indeed, the above analysis did identify the socialized mindset in this reflection, including in the writing style that seemed to say what instructors wanted to hear. Even if the student first approached Pavlis as another framework to digest wholesale, he still sees that first step as being key in his development.

Raymond identifies the turning point in his Pavlis experience as the introduction of the explicit educational theory behind our framework. In this student’s experience, this introduction occurred in the second seminar, although subsequent iterations introduced the material earlier in the course, during the first seminar:

“Once I was introduced to Kegan’s theories of adult development, the things we covered in the curriculum began making sense. I understood the need for dialogue, the value of diverse perspectives, and the purpose for identifying your strength and values.” (Raymond)

The theory helped bring the curriculum into context for Raymond. He saw the larger purpose and justification for the component skills. Raymond identifies this as a watershed moment in his self-development:

“I found myself defining my own criterion for success. I was, for the first time in my life, taking control of my future. I began to understand my future as a unique experience that I had the ability to intervene in. I could make my future what I wanted it to be, not what my parents had always anticipated it to be.” (Raymond)

Instead of being another formula to follow, self-authorship theory empowered Raymond to “take control of [his] future,” particularly in relation to parental authority, which forms a significant external authority for many traditional college students. Raymond expresses “regret” that he did not come to this realization earlier in his college experience.

For some students, pre-college experience can define expectations by contrast. Leo, who self-identifies as a first-generation college student, describes his initial values and mindset “coming into college” as
“A confident, monetarily focused and driven individual looking for a future that was different from his upbringing.” (Leo)

He sees these values reflected in his own reflection, analyzing his own text from the distance of two years:

“My first reflection as a member of the honors college shows who I was and the ideas I embodied before my college experience really took hold. I was eager ‘I will strive to take advantage of all the opportunities I’m presented with’, I was looking for applicability based upon my criteria then ‘I am puzzled as to what exactly we will be trying to accomplish’, but most important I was open to change.” (Leo)

Leo stresses the importance of his openness: although he did not understand the college’s values, he was open to their criteria. Here he echoes Raymond: if he approached the honors college at first as another formula to be followed, at least that led him to engage in the activities that precipitated change.

From this vantage point, Leo places his own prior beliefs in a cultural context:

“In today’s age, we are so socialized to follow the aspirations of others, to get the highest GPA, get that high paying job, a house, a family and of course other people’s approval and jealousy. This might even be some people’s true way to obtain the success in life of which they desire. However, I know for myself and many others this isn’t how I want to look back on my days.” (Leo).

Not only does Leo understand the roots of his values, as in the early crossroads (see Table III), but he also ranks his beliefs: he holds his own opinions, although he acknowledges the possibility that another path may make others happy. Leo recognizes the external forces that forged his previous values, but he now has formed different “beliefs, values, and state of mind” (Leo), stating explicitly, “I will not make decisions solely on a monetary basis[.]” (Leo)

Leo offers a haunting counterfactual about what his college experience might have been had it not been for the Honors Program:

“College has the opportunity to guide you to unimaginable positive paths or it can come to define your failure. I’ve seen many of my friends fall to the latter. Coming into college, I had the opportunity and the vigor to pursue success. However, what I didn’t have, was the necessary state of mind to make decisions that would get me to the life I wanted nor the understanding of what I was striving towards. Without the experiences that Pavlis exposed me too, I might have never gained the understanding of who I truly wanted to become and the confidence to take steps in that direction. Moreover, without the mentioned experiences above I would have struggled to succeed and fallen victim to societal failure. I fear this failure would have permeated my life.” (Leo).

Judging oneself by external sources can lead to believing in one’s own failure. Leo does not specify what kinds of “societal failure” threatened, but one possibility lies in his and Raymond’s emphasis on grades as a clear social marker of collegiate success (“the highest GPA”). Not all high-achieving high school students earn high grades in college, particularly in an engineering
program like those at MTU. Yet the Pavlis program encourages students to define their own notions of success.

Several students describe the utility of the Pavlis experience for helping improve the affective experience of their undergraduate educations:

“If I could start college over again, focusing more on intrinsic motivations instead of the outside influencers that I valued so much, I know that my experience in college could have been a lot less stressful. Since I’ve been here, I’ve felt pressured to achieve a level of accomplishment exclusively because others have made me believe that my GPA is an exclusive measure of my success.” (Raymond)

Other students mention specific aspects of the Pavlis experience that they see as significantly different from the rest of their college experience:

“Every day at Michigan Tech, I am exposed to new math, team development issues, problems and solutions among many other facets of college life. However, one of the things I think colleges around the USA could improve upon is tying them to the underlying life goals that each student is trying to accomplish. At Tech, we excel at the whole getting a job after college idea, but will that really bring success and happiness to students lives?” (Leo).

Two students describe Pavlis as “safe”:

“I’ve always felt like the honors seminars were a safe haven from the rest of my education because they were always a space where I had the ability to be creative and to have a voice.” (Sophie)

Yet this safety might also be described through the lens of transformative learning as a community that both supports and challenges:

“Pavlis provided a “safe” environment and discussion base to drop this control while thinking critically.” (Esme)

Another cites Pavlis as a key element of success in college and the future work world:

“Pavlis has charged me to take control of my education. Asking for clarification and questioning the roots of a solution has helped me become a better student. But I also think this same approach will make me a better engineer when I enter the professional world. Innovation doesn’t occur because people keep blindly following the paths of their predecessors. Innovation occurs because people question the present solutions and critically assess their short comings.” (Raymond)

More research will determine whether the Pavlis program has measurable effects on student’s self-authorship in the aggregate. But these students certainly report benefits from this program. The process of writing the reflections and of the class discussion give students practice talking about themselves, their feelings, and their values:
“I’m able to better articulate my values now, and I’m more sure of the choices that I make in life.” (Sophie)

Students struggle to make sense of the college experience and credit Pavlis with helping them gain skills to bridge the classroom, future worklife, and life outside of either:

“I know that wherever I end up in my career, the PHC will be an integral part of my process in both getting there and in my everyday life and career. The honors college has helped me begin to understand what I want out of my life and my career, and it has helped me to hone my ability to ask myself tough questions about my vision for the future. It has allowed me to fully realize the power of writing, discussion, and collaboration in both school and the workplace. It has given me the skills and confidence to pursue my ideas and the things I am passionate about. It has given me a broader perspective on the world and a wealth of knowledge and experiences to draw upon in every situation. These are skills that will be useful at all points in my life and that I hope to continue to develop these skills throughout the rest of my schooling and career, wherever that may take me.” (Sophie)

The students’ writing demonstrates more fluency; they write longer reflections and spin ideas out for longer stretches, which in part makes excerption challenging. While the students write about their classmates and the importance of discussions, these reflections as a whole emphasize their personal growth, a departure from the emphasis in the final reflections from the first seminar on making friends and finding surprising worth out of initially incomprehensible assignments. By the end of third seminar, the students report and demonstrate more command over their own education, both within Pavlis and in their college experiences as a whole.

Conclusion

Overall these students report benefits from the program, including the ability to articulate their feelings, values, and goals. In addition, they demonstrate increased self-authorship as they progress in the program. Their reflections show a shift from reliance on external authority for self-concept to the development of their own sense of self and direction. In their capacity to develop meaningful and rewarding relationships, they advance from seeking out individuals of similar traits or characteristics to finding value in exploring differences of culture and identity. Students also demonstrate a capacity for intrinsic motivation, a driving force for deep learning, when they reflect that the achievement of a high GPA is a socially driven construct of success that doesn’t define who they are or will become. Rather, they are defining for themselves what success looks like and exploring their own ideas and passions.

Aspects of their honors experience that students identify as particularly valuable include their cohort, the establishment of a reflective practice, and being encouraged to articulate their goals and values. These practices could be incorporated into other engineering (or STEM) curricula. Previous work has illustrated the integration of self-authorship into an explicitly interdisciplinary curriculum through reflection [29]; perhaps a similar approach to engineering curricula might highlight the various ways of knowing within and around engineering.
Further areas of exploration include increasing the sample size and doing a more comprehensive evaluation of the students’ self-authorship in relation to a similar cohort without the intervention of the Honors Program. If an effect is established, work may be done to trace it to specific elements in the program. Yet the writing in the final reflections demonstrates a depth of analysis anecdotally unusual in STEM students in their final years of undergraduate education. Certainly, these students have been asked to write more frequently and in a different genre (that of reflective writing) than their requirements for graduation in their major demand.

Sometimes merely raising a question can have a substantial impact. An engineering major in the honors program, who was not followed in the smaller longitudinal study, reported in her final reflection for the third seminar,

“When I came to the honors college I didn’t know what I wanted to do with my life or what was going to happen after graduation. It was one of the first questions my Honors Mentor asked me, What are your goals? I didn’t know! I hadn’t ever been asked to think about my goals after college before. The only goal I could think of was graduating. But what did graduating have to do with me?”

Even some engineering majors, who are by definition pre-professional, have difficulty seeing beyond the goal of graduation. Moreover, the PHC curriculum encourages students to think beyond their majors, and even their careers, in defining their goals. In a world of rapid change and uncertain future, we aim to give our students the tools not only to define their goals but also to respond when the goalposts move.

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