Demonstrated Value of Individual Development Plans to Participating Academic Trainees and Their Mentors

Barbara C. Bruno[1], Hope A. Ishii[1], Caroline E. Caplan[2], Abhay Vidwans[3], Jeffrey J. Gillis Davis[3]

[1]Hawai'i Institute of Geophysics and Planetology, University of Hawai'i Mānoa, USA, [2]Department of Physics, California State University San Marcos, USA, [3]Department of Physics, Washington University in St. Louis, USA.

Abstract

An Individual Development Plan (IDP) is a personal action plan. IDPs can be used to set academic goals, explore career opportunities, and develop skills. During the 2022-23 academic year, we implemented IDPs with two groups in university settings: (1) graduate students and post-docs in the NASA-funded ICE-Five-O project; and (2) undergraduate and graduate students at the University of Hawai'i. Twenty-four participants and their mentors rated various aspects of the IDP program on a scale of 1 (negative) to 5 (positive). Results were strongly positive, with means ranging from 4.1 to 4.8 for participants and from 4.2 to 4.6 for mentors. Overall, 92% of participants reported that they would recommend IDPs to their peers, and 94% of mentors reported that they would recommend IDPs as a mentoring tool. Although relatively few people (15%, or 31 of 207 eligible trainees) opted to participate, results of the pilot clearly show that those who created an IDP found the experience valuable. Future efforts will focus on maximizing participation.

Keywords: Professional Development; Career Exploration; Mentorship.

1. Introduction

1.1. Individual Development Plans

An Individual Development Plan (IDP) is a personal and professional development planning tool used to convert intentions into action plans. Currently, many variations of IDPs are available, including academic (e.g., Gee et al., 2019; Fuhrmann et al., 2011) and industrial (e.g., Febrian et al, 2023; US Office of Personnel Management, 2024) modalities. In academia, IDPs can be used to set and achieve academic goals, explore career opportunities, and develop a range

of skill sets aligned with one's degree program and/or intended career pathway. They can serve as a useful advising tool, to help establish expectations regarding milestones and timelines, and to track progress. IDPs can also serve as a framework for holistic mentoring, by providing a structure in which mentors can support students as they overcome obstacles and persist in accomplishing their goals (Hardy et al, 2022). Recently, the U.S. National Academies of Sciences, Engineering and Medicine (2019) highlighted IDPs as a best practice in effective mentoring, which has served to popularize their usage across the U.S.

This project adopts the IDP model developed at the University of Hawaii (UH) School of Ocean and Earth Science and Technology (UH SOEST, 2023). The UH SOEST model centers on six core competencies: Research; Teaching & Mentoring; Oral & Written Communication; Diversity, Equity, and Inclusion (DEI); Leadership; and Career Exploration (Eason et al, 2020). Trainees (students, post-baccalaureates, and post-docs) begin by completing a self-assessment, which includes responding to open-ended prompts and evaluating their skills and abilities in the six areas. This exercise primes them to consider their goals, the skillsets they may need to develop to achieve those goals, as well as their strengths. The trainee then drafts three SMART goals to be achieved within the next six months; SMART refers to Specific, Measurable, Assignable (or Achievable), Realistic and Timely (Doran, 1981). The next step is to discuss the draft goals with their academic or research advisor as well as an external professional development (PD) mentor of their choosing, and to revise as appropriate. The role of the PD mentor is to provide an outside perspective, expand the trainee's mentoring network, and to provide a safe space for candid discussions. The inclusion of career exploration and DEI modules into an IDP also encourages mentor engagement beyond the classroom or research lab.

1.2. UH SOEST

Based in Honolulu, Hawaiʻi, USA, UH SOEST is the largest and most research-intensive geoscience program in the Pacific. Its mission is *to understand the subtle and complex interrelationships of the sea, the atmosphere, and Earth in order to learn how to sustainably enhance the quality of our lives and to bring to Hawaiʻi an enrichment of intellect and culture along with technological advances well suited to the needs of these islands*. Undergraduates, graduate students, and post-docs pursue research in ocean, earth, atmospheric and planetary science and technology. Fourteen degree programs are offered, in addition to minors and certificates (UH SOEST, 2024).

1.3. ICE-Five-O

Solar System Exploration Research Virtual Institutes (SSERVI) are multi-institutional collaborations, funded by the U.S. National Aeronautics and Space Administration (NASA), to advance research at the intersection of science and exploration (NASA, 2023). Established as a SSERVI in 2019, the Interdisciplinary Consortium for Evaluating Volatile Origins (ICE Five-

O) investigates volatile evolution and how volatiles may enable future human space exploration on airless bodies like the Moon and asteroids. ICE Five-O researchers, who come from a wide range of disciplinary backgrounds (e.g., Earth and planetary science, chemistry, physics, engineering), work together to conduct experiments, analyze materials, construct models, use remote sensing tools and develop methodologies for sample curation. Graduate students and post-docs at institutions across the US, including at UH SOEST, are integral parts of the research team, working alongside senior scientists as they tackle ICE-Five-O's research objectives together. Subsequently, they embark on a wide range of careers, including academia, NASA centers, other government agencies, research non-profits, or industry. To ensure trainees develop the necessary skill sets to succeed in their chosen career pathway, each is encouraged to create an IDP.

2. Data & Methods

2.1. Participant Survey Data

Students and post-docs involved in ICE-Five-O and UH SOEST were invited to participate in the IDP program during the 2022-23 academic year. Participation involved setting three goals, reviewing/revising them with the assistance of their academic/research advisor and an external PD mentor, registering their IDP online via a google form, and completing the goals by a set date (April 30, 2023). Thirty-one trainees (undergraduates through post-docs) accepted, and they were mentored by 24 unique PD mentors (some mentors had multiple mentees). Of the 31 mentees, 27 successfully completed the program. Following program completion, participants were invited to complete an anonymous online survey to provide feedback and 24 did so, for a response rate of 77%. Respondents rated the value of various aspects of the IDP program on a scale of 1 to 5, with 5 being the most positive. The response choices were: 1 (Strongly Disagree); 2 (Disagree); 3 (Neither Agree nor Disagree); 4 (Agree); and 5 (Strongly Agree). For each survey item, Table 1 presents the mean response, along with the % of respondents who agreed or strongly agreed (response choice 4 or 5, respectively).

Respondents were also invited to provide responses to open-ended prompts to share something they liked about creating their IDP and/or something they learned. Table 2 presents a sample of representative responses received. All responses are quoted verbatim. In some cases, topically related responses from two different participants are included in the same cell.

Table 1. Participant Responses to IDP Participant Survey (n=24)

Survey Item on IDP Participant Survey	Mean	% Agree
Creating my Individual Development Plan (IDP) helped me think about and define my long-term career goal(s).	4.4	96%
By creating my IDP, I was able to convert my goals into an action plan.	4.3	100%
Conducting the self-assessment helped me identify my strengths, and identify areas where I could improve.	4.2	94%
My Professional Development Mentor provided valuable guidance and feedback regarding my IDP.	4.8	100%
Conversations with my Professional Development Mentor exposed me to new ideas, opportunities, or perspectives.	4.6	96%
My Research/Academic Advisor provided valuable guidance and feedback regarding my IDP.	4.1	71%
Conversations with my Research/Academic Advisor exposed me to new ideas, opportunities, or perspectives.	4.3	79%
I would recommend creating an IDP to other graduate students or post-docs.	4.4	92%

2.2. Mentor Survey Data

Mentors were also invited to complete a survey, and 16 of 24 did, for a response rate of 67%. Mentor respondents were asked to rate the value of various aspects of the IDP program by stating their agreement on a scale of 1 (strongly disagree) to 5 (strongly agree), as defined above. For each survey item, Table 3 presents the mean response, along with the % of mentor respondents who agreed or strongly agreed (response choice 4 or 5, respectively).

Mentors reported a low time commitment: they met with their mentees for an average of 2-3 hours per semester. Mentors were also given the opportunity to share responses to open-ended prompts, and representative responses are shared in Table 4. All responses are quoted verbatim.

Table 2: Sample participant responses to open-ended prompts on the IDP Participant Survey

Something I liked about creating my IDP	Something I learned from creating my IDP
It forced me to think about the future and form concrete, achievable goals. This was a very useful step in the first year of my graduate program.	I learned that all goals don't have to be focused academically and can be about self improvement. My IDP goals can be personal goals too, unrelated to my research.
The different categories remind you to not be narrow-focused in your goals! Successful professionals are multifaceted and the sections of the IDP remind you to think of additional aspects to a career.	I learned that talking to mentors about career options and preparing in advance for the next steps is super helpful. This prepares me to my next level with a different mindset, knowing what are the options I have and what I need to do to prepare to accomplish my future goals.
I liked the flexibility choosing my own goals gave me. It made this feel less like a cookie-cutter task and more like an individualized approach for improvement.	I switched from thinking all about research and more about career goals over the past couple months. I started thinking about what I want out of my master's and how I can gain skills to achieve those goals.
Created focused, specific, and attainable goals.	Having clear, obtainable goals helps you measure your progress throughout your program.
I am glad that the IDP program pushed me to select a mentor outside of my field of study. Having an external perspective has been grounding and refreshing.	I learned more about career options outside academia through connecting with my PD mentor. That there are government jobs on island that are also a possible future option that still incorporate my research-oriented goals.

Table 3. Mentor Responses to IDP Mentor Survey (n=16)

Survey Item on IDP Mentor Survey	Mean	% Agree
Completing an IDP helped my mentee think about & define their academic & long-term career goals.	4.4	100%
The IDP process helped facilitate communication about my mentee's research goals/timeline, areas for skill development, &/or other expectations.	4.2	88%
I enjoyed serving as a Professional Development mentor.	4.6	100%
I would recommend IDPs as a mentoring tool to other advisors/mentors.	4.4	94%

Table 4: Sample mentor responses to open-ended prompts on the IDP Mentor Survey

What do you think was the most beneficial aspect of IDPs for your mentee?	Do you feel you benefited in any way by serving as a PD mentor? If so, how?
Provides focus and clarity to achieve academic goals.	Yes, I was able to foster collaborations with UH through the work as a mentor.
It helped my mentee prioritize time and effort spent on those activities that are aligned with long-term career development.	Yes, by expanding my professional network. Making connections. Meeting prospective post-docs.
Feeling like a faculty member genuinely cared about them as a person.	Yes, makes me realize I enjoy working with students and want to do that more in my career.
As we revisited her IDP, she came to realize that certain objectives took longer than she had expected and that sometimes it was necessary to re-prioritize her objectives.	Yes - I love helping students share what they want to do when they finish and see them relieved to be in a safe, open, honest environment with their guards down, not having to prove anything to anyone except sharing what they would like to do next.
Carving out time for career development. Interviewing non-academic professionals.	I'm new to the mentor role; this is a nice exercise and framework for future opportunities to help early-career scientists and resource managers in our field!

3. Results & Discussion

Results to this IDP rollout were strongly positive, with participant mean responses ranging from 4.1 (Agree) to 4.8 (Strongly Agree) (Table 1). We note that all survey items were worded such that agreement is a positive response. Participant agreement rates (the percentage of respondents who agreed or strongly agreed with each survey item) ranged from 77% to 100%. Interestingly, the two highest-rated survey items by participants both concerned the PD mentor. Participants reported that their PD mentor provided valuable guidance and feedback (4.8) and that conversations with their PD mentor exposed them to new ideas, opportunities, or perspectives (4.6). These same questions were asked about their research advisors, and the corresponding mean responses were 4.1 and 4.3, respectively. This disparity clearly demonstrates the perceived added value of having an external mentor, which was also supported by participant comments to open-ended prompts. Mentors concur. When asked about the usefulness of the IDP program and their enjoyment in serving as a mentor, mean mentor responses ranged from 4.2 to 4.6 and agreement rates ranged from 88% to 100%. Overall, 92% of participants reported that they would recommend IDPs to their peers and 94% of mentors reported that they would recommend IDPs as a mentoring tool to other mentors.

A common theme in the mentees' open-ended responses was an appreciation for non-research-oriented goals – perhaps because these types of goals may be more likely to be de-prioritized and eventually fall off the radar due to more pressing academic matters. For example, a mentee reflected on their non-academic goal of writing their first science blog post *(Vidwans, 2023)*: "*My mentor served the main purpose of holding me accountable to my goals, and also provided specific guidance for the most ambitious goal of mine – to write my first non-technical science article. This goal was one that I would have otherwise cast aside due to its difficulty, especially because I was in the final stretch of grad school. But I was able to accomplish this goal – and have since written another article – with the help of the IDP program and my mentor.*"

Another mentee, who has since graduated and transitioned into becoming a mentor, is excited about their new role: "*I feel prepared to transition from a mentee to a PD mentor because I can reflect on the attributes I admire in my previous PD mentor and implement them to support my current mentee.*"

Clearly, those who created an IDP found the experience valuable. However, relatively few people opted to participate. Of 207 students and post-docs who were invited to register an IDP, only 31 (or 15%) did so. There are many possible reasons for this low participation rate, including unfamiliarity with an IDP, limited time, limited awareness of IDP benefits, and lack of willingness to participate in something that is not mandatory. Future efforts will focus on maximizing IDP participation, including exploring options such as making IDP participation mandatory and/or incentivizing the process. One incentive that we are exploring is offering the opportunity to apply for mini-grants, awarded on a competitive basis, to cover any costs associated with IDP activities.

4. Conclusions

Individual Development Plans have recently gained popularity in the U.S. to facilitate goal-oriented mentorship and professional development. An IDP rollout during the 2022-23 academic year resulted in strongly positive evaluation results, with means ranging from 4.1 to 4.8 for participants and from 4.2 to 4.6 for mentors on a scale of 1 (negative) to 5 (positive). Overall, 92% of participants and 94% of mentors reported that they would recommend IDPs. Clearly, those who created an IDP found the experience valuable. However, relatively few people participated, and future efforts will focus on maximizing participation through integration into curricula or use of incentives.

Acknowledgements

References

Doran, G. T. (1981). There's a SMART way to write management's goals and objectives. *Journal of Management Review*, *70*, 35-36.

Eason, D. E., Bruno, B. C., & Böttjer-Wilson, D. (2020). Individual development plans (IDPs): An underutilized advising tool in the geosciences. *GSA Today, 30*, 34-35. doi:10.1130/GSATG3GW.1.

Fuhrmann, C. N., Hobin, J. A. Lindstaedt, B. & Clifford, P. S. (2011). myIDP Science Careers individual development plan. https://myidp.sciencecareers.org/?AspxAutoDetectCookieSupport=1

Febrian, W. D., Panjaitan, A. R. P., & Soehaditama, J. P. (2023). Human capital strategic: Organization commitment, training need analysis, development people, individual development plan, and performance appraisal. *International Journal of Integrative Sciences, 2*(4), 443-456.

Gee, D., Schulte, M., & Matsumoto, R. R. (2019). An individual development plan for pharmacy students for career planning and tracking accreditation standards. *American Journal of Pharmaceutical Education, 83*(6), 6825.

Hardy, T. M., Hansen, M. J., Bahamonde, R. E., & Kimble-Hill A. C. (2022). Insights gained into the use of individual development plans as a framework for mentoring NIH postbaccalaureate research education program (PREP) trainees. *Journal of Chemical Education, 99*(1), 417-427. https://pubs.acs.org/doi/10.1021/acs.jchemed.1c00503

National Academies of Sciences, Engineering and Medicine (2019). The science of effective mentorship in STEMM. Washington DC: National Academies Press. doi.org/10.17226/25568

National Aeronautics and Space Administration (NASA) (2023). Solar System Exploration Research Virtual Institute (SSERVI). https://sservi.nasa.gov/overview

University of Hawai'i (UH) School of Ocean and Earth Science and Technology (SOEST) (2023). Individual development plans. https://www.soest.hawaii.edu/soestwp/education/mentoring/individual-development-plans/

University of Hawai'i (UH) (2024). 2023-2024 General catalog, School of Ocean and Earth Science and Technology. https://manoa.hawaii.edu/catalog/schools-colleges/soest/

US Office of Personnel Management (2024), Training and development policy wiki. https://www.opm.gov/WIKI/training/Individual-Development-Plans.ashx

Vidwans, A. (2023). Revisiting the Moon: The future of Artemis. *Promoting Science Policy, Education, and Research (June 12, 2023)*. https://sites.wustl.edu/prosper/revisiting-the-moon-the-future-of-artemis/