



A Case Study of a Highly Successful Undergraduate Aquaculture Internship Program

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Abstract

Undergraduate internships have been strongly recommended for the development of future aquaculture and fisheries. This article describes a highly productive undergraduate internship program of the South Dakota Department of Game, Fish and Parks at McNenny State Fish Hatchery, rural Spearfish, South Dakota, USA. Interns are creatively recruited. Effective supervision, including clear expectations, accountability, and self-sacrifice, is emphasized. While interns are expected to perform rudimentary and repetitive aquaculture activities, they are also given considerable independence and allowed to use their initiative to rise to the high expectations of the intern experience. A unique aspect of the internship is the possibility of assuming leadership of a research project from conception, with the understanding that the intern will write a paper for eventual journal publication. Suggestions for implementing a successful undergraduate program are emphasized.

Subject Areas

Aquaculture, Fisheries & Fish Science

Keywords

Internship, Aquaculture, Fisheries, Natural Resource Management

1. Introduction

For over 30 years, scientific societies have advocated for using undergraduate internships to develop aspiring professionals (Kelso and Murphy 1988 [1]; Jodice *et al.* 2002 [2]; Thayer *et al.* 2007 [3]; McMullin *et al.* 2016 [4]). Kelso and Murphy (1988) [1] noted that temporary internships could potentially bridge the

gap between academic priorities and employer expectations. They also suggested that internships could help undergraduates develop those soft skills needed when interacting with professionals and the general public, skills which are greatly lacking in young professionals (Eastmond and Kadlec 1977 [5]; Hester 1979 [6]; Bullard 2015 [7]). Edge (2016) [8] even went so far as to suggest that two internships should be required prior to graduation.

In addition to stressing the importance of internships, McMullin *et al.* (2016) [4] stated that undergraduate research would increase the competencies of entry-level fisheries professionals. Edge (2016) [8] called undergraduate research a “transformative educational experience” that increased student engagement. Most recently, Ecker (2019) [9] described in moving detail the effect that undergraduate research and interning had on her career thus far. In addition to the soft skills mentioned previously, research internships require students to develop new abilities (Edge 2016) [8], such as those technical writing and oral communication skills essential for career success (Stauffer and McMullin 2009 [10]; Blickley *et al.* 2013 [11]; Crawford and Dalton 2016 [12]). Just as with soft skills, these communication skills have historically been lacking in recent graduates (Cannon *et al.* 1996 [13]; Machnik *et al.* 2008 [14]; Sundberg *et al.* 2011 [15]; Sample *et al.* 2015 [16]).

This paper describes a relatively unique, and highly successful, internship program focused on undergraduate research at a state government fish hatchery.

2. Location

McNenny State Fish Hatchery is located in rural Lawrence County, South Dakota, USA. It is owned and operated by the South Dakota Department of Game, Fish and Parks. The nearest town is Spearfish, South Dakota, approximately 12 km east of the hatchery. Four full-time staff work at the hatchery, along with multiple interns throughout the year. The hatchery produces approximately 45,000 kg of trout and salmon yearly for stocking into South Dakota public fishing waters. Fish production is enhanced by considerable in-house research, with hatchery staff, including interns, typically publishing numerous journal articles each year (Higbee 2017) [17].

3. Intern Recruitment

Historically, few students have been interested in interning at McNenny or other state government fish hatcheries. These relatively-remote facilities typically lack housing, have spotty cell service, and pay relatively-low wages. And yet, student interns have become essential to the successful rearing of fish and research output at McNenny. Without interns, the record levels of fish production, the unique culture of innovation, and the unprecedented research output would not exist at McNenny Hatchery.

Despite the many challenges, enough interns, and more-importantly, enough high-quality interns are hired. How does this happen? It starts with personal re-

cruitment. While waiting for students to apply has produced some good intern candidates, cold-calling potential recruits anywhere, and everywhere, has been much more successful. Hatchery staff initiating conversations with complete strangers has produced incredible results. For example, the current research biologist at McNenny hatchery was named one of the “Top 10 Under 40” aquaculture professionals by Hatchery International in 2019. She started her career as an intern ten years earlier. She didn’t even know about a hatchery internship until an outgoing hatchery employee talked with her while she was working as a cashier at a local store. Another highly-talented intern from Utah was recruited as a result of a chance encounter while he was helping his brother move into a college dorm room in Kansas. Another biology student intern was recruited because of an overheard conversation while he was working part-time in electronics sales. These, and so many other providential meetings, have led to the engagement of dynamic future interns. These personally-recruited interns have in-turn recruited additional high-quality candidates, and referrals from both prior interns and other professional colleagues keep the intern pipeline flowing.

What’s the pitch to get these candidates to actually apply and take the position? It’s all about the hatchery culture—and not fish culture, although that does happen at the hatchery of course. The hatchery *raison d’être* is all about helping people, about wanting the best for everyone working at the hatchery, including interns. Ultimately, this is why students are attracted to the internship and why they reach extra-ordinary levels of achievement during their internships.

After the cold-call, the sales pitch is the opportunity to conduct their own project, so that at the end of the internship they have something concrete to put in their resume. They also quickly understand that they can contribute, with potential impacts well beyond the boundaries of Lawrence County, the State of South Dakota, or even the borders of the USA; they can be part of something much bigger than themselves. Obviously, the internship will include lots of routine and potentially-unpleasant chores, but for the right candidate that opportunity to make a difference is what seals the deal.

4. Intern Selection and Supervision

When it comes to actually hiring and then working with the intern, three questions are repeatedly considered:

- 1) Does the student fit within the existing and productive hatchery team?
- 2) Do hatchery staff want to make the sacrifices needed for this student to succeed?
- 3) What project could they intern do that would benefit both the hatchery and the student?

The first question is by far the most important. McNenny Hatchery has a very unique workplace culture. The ideal interns are positive, energetic, creative, adaptable, enthusiastic, and grateful. The biggest fear of hatchery staff is the potential intern will somehow interfere with the well-established, highly-productive, and incredibly-collegial atmosphere at the hatchery.

The second question is nearly as important as the first. In order to help the intern succeed, a high personal cost is required of the permanent staff. The normal rules of effective supervision apply to the internship: clear and extremely high expectations, frequent feedback, ongoing and in-depth communication, and abundant praise and recognition. In addition, the needs of the intern are recognized and addressed. Because the interns are typically younger and inexperienced, a substantial amount of time and energy is required by their hatchery mentor to ensure that they succeed. The sacrifice by permanent staff at McNenny has also become monetary at times. By using their own money, staff frequently feed the interns. One summer at McNenny, three interns had lunch provided for them nearly every day! Hatchery staff understand that when the interns know they are appreciated and that their contributions are valued, they routinely rise to the lofty expectations laid out before them during their internship.

5. College Credit

One sacrifice that the hatchery staff does not want to make is dealing with the intern paperwork sometimes required by higher education institutions. Filling out forms requesting descriptions of the intern responsibilities, completing student evaluations, and providing frequent (sometimes weekly) updates to the academic overseer is done only because it helps the student. And it is typically done begrudgingly. If the college or university wants to find willing partners for internships-for-credit, they would be advised to eliminate as much paperwork as possible (as in nearly all). Put all the paperwork onus on the student and the faculty advisor. Free the hatchery staff overseeing the internship to create the best experience possible for the student intern. The overwhelming productivity and success of McNenny interns clearly shows the benefits of eliminating bureaucracy, unnecessary paperwork, and academic exercises. It is almost unbelievable that having an undergraduate write and publish their own manuscript is still not enough internship documentation for many institutions.

6. Intern Projects

The answer to the intern project is essential because of the individual attributes and interests that each student intern brings. The hatchery does not typically get students majoring in aquaculture or fisheries. In fact, frequently no aquaculture students apply, with most of the intern candidates (including those personally-recruited) majoring in biology, chemistry, engineering, business, or education. While it might seem less-than-ideal, this is actually a fantastic opportunity! The diversity of thought, the creativity in so many areas, the disparate academic experiences, and the wide-ranging intellectual strengths that these interns bring have proven to be tremendous assets to hatchery innovation and productivity. And because of the variety of hatchery activities, plugging students into mutually-beneficial projects has never been an issue. For example, an intern who was a

pre-med major completed and published an aquaculture occupational safety and health project that we had wanted to do for several years. An education-major intern designed new high-quality interpretive signage for the hatchery (that has been copied at other locations). Engineering students have published papers on hatchery inventions and innovations, and a business major published a hatchery economic impact paper. And of course, biology students have published papers on animal behavior, microbiology, reproductive biology, and a variety of aquaculture and fisheries management topics. And so it goes, on-and-on.

7. After the Internship

The success of the internship in helping the intern get to where they want to be in a variety of careers is evident. Former hatchery interns have gone on to graduate top-of-their class in medical school, and become successful teachers, engineers, physical scientists, and business people. Many have gone to graduate school in a natural resource field. Still more are now working in aquaculture and fisheries outside of South Dakota. Most importantly, hatchery interns are routinely hired to fill permanent positions at McNenny Hatchery, other South Dakota state-owned-and-operated fish hatcheries, and within the South Dakota Department of Game, Fish and Parks. (See **Appendix**)

8. Conclusion

In summary, the McNenny intern experience starts with a well-defined vision of excellence in research and innovation for the hatchery itself, which is frequently and clearly communicated to all of the permanent staff, interns, and volunteers. This vision forms the basis for a hatchery culture of high expectations, optimism, encouragement, creativity, unselfishness, and initiative. This culture of affirmation envelops the intern program, so that interns know they are an integral part of the hatchery team and their unique contributions are valued and celebrated. In turn, the interns that buy into the hatchery philosophy and accept the opportunities presented to them, frequently exceed our high expectations. Writing one manuscript is a major undertaking, but a number of students have written two, or even more, papers during their internship.

Conflicts of Interest

The author declares no conflicts of interest.

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Appendix

Actual intern quotes:

- 1) “Working at the hatchery changed my life.”
- 2) “Being at the hatchery was a great experience because it showed me not only how to apply biology to real life situations, but how to do the process of writing and publishing scientific papers.”
- 3) “The worst part of the job is going home smelling like fish...”
- 4) “...it is probably one of the best things that happened to me. I started out not knowing what to expect and it opened up several doors and great adventures!”
- 5) “Interning at the hatchery gave me research and manuscript writing experience and changed my career path.” - note: student switched majors and now is completing an aquaculture grad degree.
- 6) “My experience with the hatchery was quite unique, as I had no background in wildlife biology and was pursuing a career path which was very far from anything fishery related... On top of the knowledge I gained, I was also able to meet great people and was granted the opportunity to explore occupational health exposures faced by hatchery workers which tied in well with my goals to become a physician. Overall, it was one of my favorite job experiences I have had would highly recommend it to others.” Note: student published a manuscript, currently in med school.
- 7) “The internship at McNenny was the perfect balance of mental work and getting my hands dirty. It is the only job where you can learn both how to think and write as a scientist, and also overcome your queasiness to fish poop. This semester I am enrolled in a class entitled “Research and Evidence Practice in Physical Therapy.” I looked through the syllabus today and saw that most of the things to be covered in that class are things I learned from my time at the hatchery.”

Note – published a biochemistry paper resulting from his internship and is currently in PT school.

- 8) “I would love to say a few words about my internship at McNenny, after all, it is where it all started for me. Since I was a kid I have always wanted to work in fisheries as a biologist. My experience working as an intern at McNenny Fish Hatchery assured me that fisheries is indeed the right career choice for me. What makes McNenny so great is the opportunities they provide to their interns as well as the work environment they have created. The work environment is friendly and supportive which makes working there fun! During my time at McNenny I was able to conduct research, publish a paper, as well as present at a Chapter AFS meeting. I was also able to increase my fisheries knowledge in both fish culture and fish management. All of these accomplishments would not have been possible if it were not for the help of the staff at McNenny State Fish Hatchery. Not only was I able to build a strong resume due to this job but it also led to future opportunities in fisheries; including a graduate project in fisheries management. The staff at McNenny goes above and beyond to see that interns

are treated not as subordinates but as valued colleagues. In my opinion, this respect that the staff gives to its interns is what creates positive relationships between new interns and existing employees in the fisheries community. I'm grateful to have been a part of the McNenny team and highly recommend anyone interested in a fisheries career to apply for open positions at the McNenny state facility."

9) "Interning ...was one of the best decisions I've made. Not only was I exposed to a wide range of work within fisheries, I was mentored by knowledgeable people in this field. Throughout my time in the Black Hills I learned about fish through field work, lab work, office tasks, and my own research project. The whole time I had supervisors who helped me along the way. These individuals opened my eyes to new experiences and continue to help me in my professional pursuits.

This position did what internships should always try to do. It exposed me to a wide range of tasks within a field and introduced me to many people who helped me narrow down my interests. I look back on my time in South Dakota with fondness and am thankful that I got to call it home."

10) "Internships are the stepping stones to a successful career and because of my internships I was able to develop my skills as a young professional which subsequently gained me a dream career in fisheries. That being said, I had some great guidance...Thank You"

11) "As we go through life there are times and places that make an impact on who we are. The experience I had at McNenny taught me that I was meant to connect people to the natural world and I had a voice to do it. Today, I work for a land conservation organization in Western Maine. I spend my days walking streams with campers teaching them about watersheds and fisheries, doing my best to connect them with the world that McNenny introduced me to."

12) "A fish hatchery is a strange world to walk into. It's even stranger when the only thing you really know is that you don't mind fish. Through my internship I was soon to find out that I not only didn't mind fish, I found them fascinating and talking to people about the work done at a hatchery brought me endless satisfaction. I spent a year as an intern for South Dakota's McNenny State Fish Hatchery in 2011-12. In that year, I wrangled more fish than I could have dreamed, I educated more visitors than I had hoped and I learned more about myself than I thought a fish hatchery could teach someone."

13) "I'm going to be applying for a research scholarship this summer. My faculty advisor told me that the fact that I am a published scientist already puts me in a completely different class than everyone else who will be applying, so I wanted to say thanks for giving me that opportunity."

14) "I think the coolest thing about my internship was the juxtaposition of roles, from the lab/sciency part to the operation of heavy equipment. Hatchery staff went above and beyond to tailor the internship to my individual interests and goals, which I appreciated very much. Helping me publish my aquaculture manuscript was so thoughtful on your end and it turned into something amaz-

ing for me!

15) “I personally enjoyed getting to work for a boss that makes the best popcorn and takes you to Taco Johns!”

16) “My time as an intern at McNenny remains one of the most important experiences of my life; I matured so much professional and personally, and am beyond thankful for that opportunity.”

17) “...my experience there remains one of my favorite working and learning experiences ever...”

18) “Interning at McNenny taught me countless useful things, like how to vacuum fish poo, the proper way to throw trout into a creek, and how to make chili with literally anything in the kitchen. Perhaps most important, though, was not even the content of the internship--hatchery operations and interpretive signage design--but the environment in and methods by which I learned it. The immersive nature of a professional internship with a state natural resource agency really acquainted me with proper planning and goal-setting before and throughout a project. These are the sort of lessons I may have learned in elementary or high school but probably rolled my eyes at; seeing them applied to fish stocking, aquaculture research, or interpretive writing gives these values a usefulness they never really had to me before. Also important was the work culture that I became part of, one that might be unique to McNenny. There was a sense of camaraderie among the interns and non-seasonal employees that had not and has not yet been equaled in any work I've had since. To me, it felt like there was an understanding that we all had different strengths and years of experience in hatchery work, but a trust that we could all be relied on to accomplish whatever was needed on a given day. There's a mutual respect that rises from those attitudes, and overall it's a quality that I make an effort to cultivate in all of my work environments to this day.

...And it's not to say that I haven't enjoyed any other work beyond McNenny. Just felt like things operated on another level there; it was like being a part of a friendly, relaxed, and yet well-oiled operation.”