



Introduction

Another month has gone by, and it is time for another installment of the SES newsletter. I thought long and hard about the topic and decided on a topic that hasn't shown up as a potential topic in past newsletters. The topic this time around is training, and a dive into how we can train better for our professions.

Demetri's Corner

Not much has changed on my end, so I'm still not ready to write a "how to develop business as a small company" newsletter yet, but I'm optimistic that this is a learning process and the company will be stronger on the other side (see today's topic).

I have started to add more information on the company website to expand the visibility of my vision for the company and provide a starting point for future collaborations. On the last newsletter, I discussed a potential future white paper on sustainable housing. The topic ended up being too large for a single document, so I'm taking it in pieces, and the first piece on a hot water system is posted under the design section of the SES website. Comments encouraged (I can take it). Obviously, I'm open to discuss any of the newly posted information (mostly under the "Design" section).

With self-promotion out of the way, on to the topic of the month!

Today's Subject – Education and Training

I've been involved in a lot of training in my life. I've undergone training in almost every perceivable way spanning from getting an engineering degree, learning how to use machining equipment on the job, going through the Naval Nuclear Propulsion training pipeline, and learning how to be a consulting engineer. During that time, I've built up a respect for the power of training, and a hatred for when it just wastes time.

I would broadly categorize training as "formal" and "on the job (OJT)". There are certainly grey areas (like labs, nuclear prototype, etc.) where the two are blended, but the gist is recognition of the primary method used to gain knowledge, be it from studying or experience.

We all start down our professional training path squarely in the formal category as it pertains to primary and secondary education. It involves a lot of studying, taking tests, and structured evaluation of skills. After this initial training we transition into the professional world where there is an expectation that basic knowledge gained through the initial formal training will allow you to gain knowledge through experience. It's a good format that has worked for a long time, but we often miss a few points about how this could be more effective.

1. Not everyone learns at the same speed, with the same methods, or in the same way. The ratio of formal training to OJT training is almost certainly not optimized for anyone and is instead an accepted ratio that has generally produced good results for the average professional.



2. OJT training is often shortchanged on its value and poorly executed. Mostly this is due to inconsistent applications and opportunities as well as a bias against OJT as a result as opposed to a byproduct of profitable work.
3. Continual formal training is an important part of staying current and viable in a profession. Most professional certifications require some level of continuing education, but it is generally a poor imitation of the type of formal education we all go through during primary and secondary education and does little to grow capability.

I will dive into these specific points to explore how we can be more effective in providing training and making the most of training opportunities.

Ratio of Formal and OJT training

Professional training generally starts with some initial formal training that establishes a baseline of knowledge. This is followed by transitioning to a work environment where the knowledge is exercised, and profession specific skills are obtained. While executing work, continuing education provides formal training on updated skills and information that enhances professional performance.

Initial Formal Training

Initial formal training is generally fixed in curriculum and duration for most professions. The purpose of this initial formal training is to obtain basic knowledge required to transition to a work environment. This required knowledge ensures that enough professional responsibilities can be assigned so that OJT can be effective.

The ability to learn technical information in a formal system will be highly variable between individuals. This is addressed in some ways with the ability to take tests for college credit during high school that reduces the amount of formal education when it can be proven that knowledge has been obtained, though access to this opportunity is often limited. Otherwise there are few opportunities to tailor the duration and scope of initial training, resulting in inconsistent levels of professional knowledge gained by those completing the course of training.

An alternative approach could be for the academic community to make a more concerted effort to demonstrate required knowledge prior to completion of courses so that the formal phase of education is accelerated. Conversely, the ability to augment formal training or extend its duration should also be available to ensure that proper training is provided so that the level of knowledge is similar for all of those completing this phase of training. Note that neither is an indication of the capability of the individual to be an excellent professional and should not be stigmatized if the goal is to ensure consistent core knowledge at the completion of initial formal education.

Another underappreciated aspect of this initial formal training is its role in teaching people how to learn. The process of being presented information, absorbing it, and regurgitating it itself a skill gained during initial formal training. And of the skills gained and exercised, it may have the most long-term value, as discussed in subsequent sections.



After initial formal training, continuing education is required for most professions, whether per certifications or expectations. This is another form of formal training that is generally standardized to some extent and documented. It is addressed in detail in a subsequent section, but its overall impact on training is generally very low. This devalues the importance of formal training after the period of initial training as it is generally a requirement, but rarely considered highly valuable. In almost all cases, the ratio of formal training after a professional has transitioned to the workforce is much too low to allow for adequate maintenance of technical skills and the ability to stay current in the industry. Unlike the initial formal training, the goal is just continued exposure to the academic aspect of the profession, and not consistent transfer of information, so it is less critical that the effort put into the training is tailored to individuals, but rather that all professionals realize the importance of this continuous formal training.

On the Job Training

The start of on the job training (OJT) generally occurs at a company with other experienced professionals, either as an employee or intern. Dependent on the work, this OJT can take a lot of different forms, from a structured qualification process to gaining experience with increasing levels of exposure to the profession. I've experienced both, in terms of formalized qualification in the Navy and completely self-guided experiential learning as a consultant strategically choosing projects to work on. Note that neither will work if the initial formal training has not covered the ground of teaching people how to learn. In a subsequent section the merits of both types of OJT will be discussed and weighed.

Regardless of this discussion, balancing OJT with the needs for the company to make a profit will result in tension if the long-term importance of this training is not considered. Many factors come into this calculus, including the type of OJT performed, the ability for a professional to benefit from the OJT, and the vision for the future of the company in terms of skills and capabilities required in the workforce.

In my experience, plenty of OJT is available to any professional actively seeking to learn more about their industry. Note the caveat here – actively seeking. In most cases, OJT is not well publicized and administered even more poorly. This is a function of the company focus on making profits rather than burning money on unqualified people billing to projects. The onus is on the professional to seek out OJT opportunities and insert themselves into situations where experiential learning will occur. This is uncomfortable, and many will not go to these lengths, resulting in an uneven application of OJT. Determining the appropriate amount of OJT to maximize the potential for an employee is therefore difficult unless the personality of the individual is taken into account and opportunities are readily available with no stigmatization.

The Value of On the Job Training

As previously discussed, OJT comes in essentially two forms: qualification based training and project based training. They both have merits and deficiencies, and the best training program for a company will be dependent on many factors including industry requirements, client base,



project availability, training budgets, company culture, etc. Advocating one type of OJT over the other is dismissing the value of either, so both are discussed below.

Qualification based training is prevalent in regulated industries and the military. It provides a standard to determine the suitability for performing tasks based on semi-quantitative metrics of past performance. In this way it is similar to initial formal education, except the classroom is the workplace. The merits include:

1. It provides some consistency on the expectations.
2. More substantive training records can be provided for purposes of traceability and training improvement.
3. It increases the visibility of training as an important part of the company.
4. It is easily adaptable for a variety of disciplines.

That said, qualification based training can certainly go awry, mostly by being overly prescriptive, prone to inconsistent application of acceptance standards, and making the training program too burdensome. When putting together training programs, it must be realized that not everyone will get the “ideal” opportunities. This reality must be faced so that appropriate experience, even if only tangentially related to the qualification are considered as viable alternatives. Additionally, people authorized to certify whether qualifications are met must have a consistent view on what is required. That itself requires training, so there is a snowball effect to be controlled. A balance must be struck between enough training to ensure consistency and not so much as to frustrate personnel and impact company productivity.

Project based training can be very effective if the correct opportunities are given to the correct people at the right time. It's the “throw them into the fire” mentality and has some of the following merits:

1. It is highly motivating for someone to learn new skills if they directly relate to current, valued work.
2. It is likely cost effective as some marketable value will be immediately realized.
3. Skills learned when people are “in the fire” tend to stick better and be more usable later.
4. A sense of camaraderie is gained from people working together in a project setting.

If the stars align, placing someone with the correct mindset in a situation where they are forced to quickly learn new skills that are immediately used in a meaningful way is by far the most efficient means of training. But aligning the stars is rare and results in training that is difficult to make consistent, document, and verify skills for use in future projects. It is unlikely that enough project based training will be available so that everyone can learn all of the skills required. This would require an immense amount of new work, oversight, and project throughput, which would highly stress an organization and likely reduce overall project performance.

Continuing Education

Regardless of your profession, the concept of continuing education is key to continued success. It is often overlooked, or where required by certification treated like a check in the box. There is



much to be said about the value of working daily in your profession, as this provides experience and depth of knowledge. Continuing education is not this. Continuing education is expanding your knowledge base and staying current in a field that you've been steeped in for years. It's often easy to get into a habit of how you execute your work, and continuing education can be the stimulus that allows you to see your profession in a different way. This perspective can greatly enhance your effectiveness in performing future work, understanding new challenges, and broadening your knowledge. Therefore, the role of continuing education is not to re-enforce information that is already known, but rather learn something new. This can be difficult for an experienced professional as it will certainly be the case that someone "new" will know more than them and it will feel like starting over.

Concepts on How to Implement Training

There is little that could be done about the initial formal training as it is so engrained in tradition and expectation. Suggestions were proposed, but unlikely to be implemented in the near term. Non-traditional degrees are becoming more prevalent, but mostly for cost saving purposes rather than reforming the education system to be more effective. There is still the possibility that change may happen given the increased focus on skills-based training in some fields.

I'm going to focus instead on how training is implemented in the professional setting as this can be addressed by companies immediately. For purposes of this discussion, I'm going to indulge myself and imagine that I have achieved the final vision of my company. In this currently unrealized company, there are approximately 15 people with mostly engineering degrees performing all functions of the company. The work split is 25% project based consulting, 50% fixed price product development, and 25% "other". The training strategy would be mostly documented qualifications for specific skills that market the ability of the company to execute the type of work pursued. The training would be based primarily around the product development work as it would be more within the control of the company. That said, when a project opportunity arises that would be an excellent training event (see stars that have to align above), it would be leveraged for maximum value, in most cases with the trainee being of no cost to the project so that there is minimal pressure to limit their exposure to as much of the project as possible. This is expensive for the company, but when properly used, the most effective way to grow people.

For continuing education, the company would bring in external experts in a field voted upon by the company as "interesting". This would not necessarily be an instructor, or certified trainer. It would be someone that has a great depth of knowledge in an area outside of the expertise of the company to improve breadth of knowledge. This could be an industry expert, a university class, participation in conferences, etc. The advantage with this approach is the potential to engage with other areas and potentially industries that would normally not be part of the daily conversation of the company.

All of this costs time and money. Therefore, a substantial commitment is required by those receiving the training and those providing training to ensure the best use of this significant



investment. Finding the balance between providing the correct amount of training without overburdening the company would have to be constantly assessed to ensure continued value and enthusiasm. Continual review of the training strategy, personnel being trained, market skills that are highly sought after, and need for growth by the workforce must all be considered. As the strategy is to make better professionals so that the company is stronger, including these professionals in all aspects of this training balance is crucial, and enhances the quality and applicability of the training.

Your Dose of Aphorisms

There are so many sayings that go with training. Coming up with something original is difficult at best. But one thing that I think is missing from common conceptions of training is the value of initial formal training in establishing the ability to learn the “really valuable stuff” during the process of gaining experience. On that note I leave you with:

If you learn how to learn, there is no skill beyond your reach.

The Future

Any comments or suggestions on the discussion in this newsletter or for future newsletters will be welcomed at newsletter@sigmaexpertsolutions.com. The following list of topics is being considered for the future, and any strong opinions on any of the below or additions can also be expressed to the same address.

- Engineering Ethics
- The Role of Automation – Additional Subjects
- Managing Technical Teams
- Software development
- The Role of Rapid Prototyping
- Commercial Grade Dedication