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Comments to the National Strategy for Expanding American Innovation

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Comments

National Strategy for Expanding American Innovation

Docket No.: PTO-P-2020-0057

The following comments were written by law students at Santa Clara University School of Law for a Patent Law class assignment.¹

The views and opinions expressed in each comment are those of the authors and do not necessarily reflect the opinions or positions of Santa Clara University School of Law.

¹ Patents (Law Class 233) taught by Professor Colleen Chien, assisted by Ernest “Ernie” Fok (’21 SCU Law grad).

EXECUTIVE SUMMARY

The Strategy for Expanding American Innovation is an important and ambitious endeavor to increase the diversity of participation in inventing. We draw upon the rich diversity of students at Santa Clara University School of Law to submit this collection of comments from a class of 20 students that includes:

- 25% patent agents, combining for decades of patent prosecution experience,
- One inventor,
- A former worker in a University Tech and Commercialization Office,
- 15% PhDs, and 33% advanced technical degrees,
- Two former USPTO externs.

The vast majority of the students are the first in their family to go to law school, and some, to engineering school. Their gender, ethnic, sexual orientation, and disciplinary diversity informs their viewpoint and experience diversity, in submitting these comments. A few highlights of our 68-page submission:

- **Matthew Hogdson**, a patent agent, inventor, and counselor to startups as part of Santa Clara’s Entrepreneur’s Law Clinic, in a joint submission with **Tyler Cox**, recommends concrete steps the USPTO should take to make it easier for small inventors to get their patents: “As a second-year law student: I am surprised at the number of times I have been asked by individual inventors and small businesses for patent advice. Most of the questions I receive are relatively simple and these small entities could answer them on their own if they had access to more resources and information.” (p. 39);
- **Erik Perez** (Twitter: @Erik_Perez18) and **Grant Wanderscheid** recommend a “shift towards achievement through failure” in order to support creativity and novel idea generation in educational institutions, drawing from their own experiences with science and engineering education at the undergraduate and graduate levels. (p. 7);
- **Ernest “Ernie” Fok**— a former higher education professional, future patent litigation associate, and advocate for the Asian-Pacific American and LGBT legal communities— recommends that the USPTO “help overcome cis-heteronormativity in STEM and drive queer involvement in innovation by (1) working with other federal agencies to consider queer identity as a form of diversity, (2) increasing reliable demographic data on queer participation in inventing, and (3) improving the agency’s own practices to better support the queer STEM professionals.” Cis-heteronormativity, the assumption that gender is binary and that heterosexuality is the only normal sexuality, marginalizes queer STEM professionals and reduces innovative capacity in the patent system. (p. 33);
- **Sajeev Sidher**, a partner at a major accounting firm with several decades of experience, recommends adopting several tax credits and benefits targeted at small minority and women-owned businesses that develop patented technologies: “The growing diversity gap with respect to innovation as a whole and with respect to patents specifically should

trouble us all. The patent system is a critical incentive to drive innovation as the resulting exclusive rights allows the inventor to earn a return over the life of the patent commensurate with the inventor's investment. However, for the individual inventor, a patent as a property right can be the vehicle to generate wealth and secure social and financial upward mobility for the inventor and her family potentially over successive generations." (p.55).

- From a female patent agent who has been practicing for thirteen years, including at two major, IP-specialized US law firms and as an in-house legal member for a Fortune 500, life science company from the Bay area, who recommends carrying out a study of all-female inventions: "I personally did not have a single occasion where women-only clients, either solo or in group, came and sought patent protection." (p. 64).

This document groups comments by submission topic as follows:

- One comment addresses participation in patenting and how the USPTO can incentivize women and minorities to participate in the patenting process (p. 1).
- Three comments address the need to prepare people to obtain the skills and interests needed to become innovators, problem solvers, and entrepreneurs. These responses focus on how the USPTO can emphasize creativity and novel idea generation in school curricula (p. 7), serve rural and disadvantaged communities (p. 16), and prepare high school teachers to educate the next generation of students about patenting (p. 20).
- Four comments respond to the practice of innovation. This includes recommendations on how the USPTO can increase the number of underrepresented inventors (p. 25), remove barriers to hiring and intra-team collaborations (p. 30), destigmatize queerness in STEM fields and invention (p. 33), improve its website and programming to better target individual inventors and small businesses (p. 39), and support diversity among patent attorneys and agents (p. 46).
- Three comments suggest ways to improve the personal and societal benefits of innovation. Suggestions include how to secure financial support for a broad and diverse group of inventors and entrepreneurs (p. 51), utilize the tax code to drive innovation investment in minority and women innovators (p. 55), and boost innovation through conference partnerships (p. 61).
- One comment addresses the development of the national strategy to expand the innovation system demographically. The recommendation is on how to conduct in-depth studies of all-women inventor teams (p. 64).

Respectfully submitted,

Ernest "Ernie" Fok, 3L, Santa Clara University School of Law in collaboration with Colleen Chien, Reg # 55,062, Professor, Santa Clara University School of Law.

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INCENTIVIZING WOMEN AND MINORITIES PARTICIPATION IN THE PATENTING OF INVENTIONS

To:	United States Patent and Trademark Office (“USPTO”)
From:	Stella Collet, LL.M. Student at Santa Clara University School of Law Anonymous, Law Student at Santa Clara University School of Law
Date:	February 4, 2021
Re:	Comments Regarding the National Strategy for Expanding American Innovation, Docket No.: PTO-P-2020-0057

Question Addressed

I.2 - Women and some minorities have not participated proportionally in the patenting of inventions. What barriers to innovation inclusion are specific to underrepresented groups? What supporting role should government organizations play in helping underrepresented groups overcome these barriers?

Short Answer

Women and minorities face multiple barriers which relate to implicit bias, unfair patent bar exam requirements, social norms, resource impairment and lack of exposure to the patenting process. To overcome these obstacles, government organizations should raise awareness regarding implicit bias (preferably through such means as social media), and try to incentivize women and minorities participation by offering award prizes and funding specific to that category of applicants, increasing welfare and funding for schools in poor areas, developing mentorship programs and broadening the USPTO’s patent bar exam requirements.

As Santa Clara Law students, we are delighted to provide an answer to this question. The following answer will be organized in two parts: the first focusing on why this question is important (I), and the second providing the full detailed answer (II).

I. The importance of the question

This interrogation is crucial as the lack of diversity in the patenting process weakens the scope of innovation.

There is no denying that innovation inclusion will lead to more diverse inventions. Understanding and addressing the barriers encountered by women, minorities and lower-income individuals in the patenting process will allow them to share their ideas, thus creating inventions which may answer a need from members of their underrepresented groups. For instance, since

the increase of the participation of women and minorities, we have witnessed more inventions relating to hygiene products, as well as curly hair products.¹

This will also lead to the increase of inventions relating to certain fields that are currently underrepresented, those fields being primarily composed by women, and may incentivize innovation in those particular fields.²

II. The answer

1. Underrepresented groups suffer from multiple barriers which prevent them to access the patenting process, among which are the following:

The first barrier relates to implicit bias, which refers to our unconscious stereotypes. According to the American Bar Association, everyone has biases.³ If not acknowledged, these can influence an individual's decisions to the point of causing unfairness towards certain groups of people, such as women or minorities. These unconscious stereotypes have negative effects in diversity and inclusion in different areas, including innovation, thus affecting underrepresented groups participation in the patent application process.

Regarding women, the data released by the USPTO shows that they only represented 12% of the patentees in 2016.⁴ This could partly be the result of bias in the patent application process. Moreover, an author suggested that the emergence of vague patenting standards, such as the lack of guidance surrounding what an abstract idea was⁵, allowed more discretion by examiners. This increase in discretion could have possibly been the cause of more implicit bias towards women, as the author reports it is primarily on subjects like these that *"women face the greatest allowance rate disparity in comparison to men."*⁶

In addition, some studies have shown that *"women inventors are increasingly concentrated in specific technologies and types of patenting organizations, suggesting that women are specializing where female predecessors have patented rather than entering into male-*

¹ Women are often the inventors of women related-products, especially in the natural curly hair care product industry, where many businesses which have patents were or are owned by women (e.g: Gwen Jimmere, CEO of *Naturalicious*, known as the first African American woman to own a patent for a natural hair care product ; or *Scrunch It*, a women-owned business with its patent currently pending on the scrunch it brush meant to define curls; or Sarah Spencer Washington who patented her method for straightening hair and Madame CJ Walker aka Sarah Breedlove, often cited as the first millionaire African American woman who highly contributed to this field.)

² Field of Psychology, Arts or Esthetics.

³ Karen Steinhauser, *"Everyone is a little bit biased"*, March 16 2020, link:

https://www.americanbar.org/groups/business_law/publications/blt/2020/04/everyone-is-biased/

⁴ Report to Congress pursuant to P.L. 115-273, *"The SUCCESS Act"*, USPTO, October 2019, p. 8.

⁵ Past tense was preferred as this lack of guidance is being compensated by the release of a new guidance from the USPTO in 2020, which aims to specify more in detail what an abstract idea is under the Alice Framework.

⁶ Jaclyn Alcantara, *"The impact of implicit bias on female applicants"*, UMKC Law Review, 2019, p. 170.

*dominated fields or firm.*⁷ Because of these facts, the women inventors rate grows slower, and it is more likely to remain attached to those specific areas where other women participate or have already patented, showing the importance of addressing the disparity in participation between women and men in the patenting process, attributed in part to implicit bias towards women.

Minorities potentially face similar struggles resulting from biases. For instance, some studies have shown that some employers discriminate on the basis of an applicant's name in the recruiting process.⁸ Unfortunately, this type of discrimination could very well be occurring within the patent application process. Although to our knowledge, we lack studies on this specific matter to be able to support our allegation.

The USPTO's patent bar exam requirements also present a second obstacle against women innovators. One letter from Senate members pointed out that among the qualification requirements for patent practitioners, the USPTO's Office of Enrollment and Discipline extends automatic qualification for the patent bar exam to those with undergraduate degrees in certain subjects, but it does not provide automatic qualification for master's degrees or doctorate degrees in the same subjects⁹. In other words, those with master degrees or doctorate degrees will not automatically qualify without the enumerated undergraduate degree. This becomes a disadvantage for women innovators who want to become patent examiners because data shows that *"women earn master's degrees in STEM fields at a higher rate than they earn undergraduate STEM degrees in the same subjects."*¹⁰ Furthermore, it cannot be excluded that less women among patent practitioners could be one cause of bias, potentially leading to a lower rate of patents granted to women innovators.

The third barrier affecting both women and minorities lies within our "social norms."¹¹ For example, it seems to be implicitly accepted that women should be the ones to make time to care for children. In fact, the COVID-19 pandemic reminded us of this issue when homeschooling was seemingly conducted mostly by mothers¹², along with domestic labor¹³. Some data suggest that women researchers have in fact been publishing significantly less since the start of the

⁷ Office of the Chief Economist IP Data Highlights, *"Progress and Potential A profile of women inventors on U.S. patents"*, February 2019. http://www.equality-of-opportunity.org/assets/documents/inventors_summary.pdf

⁸ Sonia Kang, Katy DeCelles, Andras Tilesik and Sora Jun, *"Whitened résumés: Race and Self-Presentation in the Labor Market"*, Administrative Science Quarterly, January 22 2016.

⁹ Mazie K. Hirono, Thom Tillis and Christopher A. Coons, letter concerning an alleged gender gap among patent practitioners, December 11 2020.

¹⁰ National Center for Science and Engineering Statistics, *"National Science Foundation, Women, Minorities, and Persons with Disabilities in Science and Engineering"* January 2021. <https://nces.nsf.gov/pubs/nsf19304/digest/field-of-degree-women>

¹¹ In this context, the term *"social norm"* refers to what is commonly accepted as being normal in one's society.

¹² Claire Cain Miller, *"Nearly half of men say they do most of the homeschooling. 3 percent of women agree"*, New York Times, May 6 2020.

¹³ Daniel L. Carlson, Richard Petts and Joanna R. Pepin, *"Changes in Parent's Domestic Labor During the COVID-19 Pandemic"*, May 6 2020, link: <https://osf.io/preprints/socarxiv/jy8fn>

pandemic compared to previous years.¹⁴ Women recognize this as being an impediment to their career. To this can be added that the number of black families with a single mother is considerably higher than that of the white families.¹⁵ These sacrifices undeniably weigh really heavily on women's careers.

Resource impairment is another barrier minorities face: in spite of some living in innovative states¹⁶, minorities tend to be living in poorer neighborhoods due to lack of resources. For instance, in 2020, it was found that, black families on average had a median household income of approximately 41,000 USD, compared to white families who showed a median household income of 70,000 USD.¹⁷ This undeniably leads to less money to invest into innovation, and less opportunity to be able to pay for better education. A study has also shown that children from high-income (top 1%) families are ten times as likely to become inventors as those from below-median income families.¹⁸ This is because economic and educational resources, among others, are critical to succeed in innovation, and due to the lack of these resources and the big gaps in their household income, many African Americans and other minority inventors have been left behind.

Finally, low level of awareness due to lack of early exposure to the patent system is also to blame for the gap in participation from women and minorities.¹⁹ It makes it difficult for these underrepresented groups to innovate because they are less familiar with the patenting process as well as how to protect their inventions. As a consequence, the U.S. has been missing out on significant inventions.

2. Role that government organizations should play:

First, government organizations should raise awareness about implicit bias and its consequences, including those specifically occurring within the field of innovation. The best

¹⁴ Giuliana Viglione, "Are women publishing less during the pandemic? Here's what the data say", 20 May 2020, link: <https://www.nature.com/articles/d41586-020-01294-9> ; Juliet Isselbacher, "Women researchers are publishing less since the pandemic hit. What can their employers do to help?", July 9 2020, link: <https://www.statnews.com/2020/07/09/women-research-covid19-pandemic/>

¹⁵ Statista Research Department, "Number of Black Single Mothers U.S. 1990-2019", January 20 2021, link: <https://www.statista.com/statistics/205106/number-of-black-families-with-a-female-householder-in-the-us/>

¹⁶ For example, California or Texas.

¹⁷ Christine Benz, "75 Must-Know Statistics About Race, Income, and Wealth", June 8 2020, link: <https://www.morningstar.com/articles/987356/75-must-know-statistics-about-race-income-and-wealth> ; Aron Szapiro, MorningStar Inc., "Can baby bonds shrink the racial wealth gap?", October 6 2020, link: <https://www.morningstar.com/articles/1003066/can-baby-bonds-shrink-the-racial-wealth-gap>

¹⁸ Xavier Javel, "Who Becomes an Inventor in America? The Importance of Exposure to Innovation", SIEPR, December 2017, link: <https://siepr.stanford.edu/research/publications/who-becomes-inventor-america-importance-exposure-innovation>

¹⁹ Health Law & Business News, "For Black Inventors, Road to Owning Patents Paved With Barriers", July 2020. <https://news.bloomberglaw.com/health-law-and-business/for-black-inventors-road-to-owning-patents-paved-with-barriers>

way to fight implicit bias is to raise awareness of its occurrence so that everyone can work on their own biases. This could be achieved as follow:

- Continual governmental information and communication on this matter, preferably through such means as social media to reach the highest number of individuals. This includes of course governmental websites, but also third party platforms widely used among the population such as YouTube, Twitter, Facebook or Instagram.
- Propose educational courses discussing implicit bias, preferably quite early in the education system, such as middle and high schools. We know that our unconscious stereotypes can be unlearned through a gradual process;²⁰ thus, this early training may help to recognize and unlearn it, therefore creating the opportunity for diverse students to participate more in innovation. This could lead to an increased diversity in STEM colleges.

Second, government organizations should incentivize innovation coming from women and minorities by offering award prizes and funding which would be specific to that category of applicant. Governmental award prizes have long been used as a method to encourage innovation among businesses and individuals. These prizes often focus on certain technologies or fields, for example inventions relating to space²¹ or those enabling autonomous vehicles.²² We believe the innovation field could benefit from prizes that would be specific to underrepresented groups, such as women or minorities. Since these groups often face additional challenges as discussed above, it seems only fair to entitle them specifically to certain awards or funding.

Third, government organizations should aim for increasing both welfare for families/individuals in need and funding for schools located in poor areas. We believe savings, better education and healthier lifestyle are the key which enables one individual to effectively innovate. However, as explained above, financial disparities exist between American families, some living as a result in the poorest neighborhoods of the country, most of whom are minorities.

As mentioned, one way to correct this is to provide families in need with more welfare. Women, especially single mothers, struggle to find the time to both take care of the children and manage their career. However, a study suggested that the issuance of welfare could be related to the increase of employment among single mothers,²³ as financial assets certainly allow them to seek extra help, such as affording babysitting when necessary. Increasing the funding for public schools located in the poorest neighborhoods could also be beneficial for the inhabitants. In addition, the inclusion of programs which cover the subject of innovation could also help incentivize innovation among minorities at a young age.

²⁰ Kimberly Papillon, Implicit Bias Training, event held at Santa Clara Law school on Wednesday, January 27 2021.

²¹ The Ansari X Prize in 2004 which offered 10,000,000.00 USD to the winner.

²² The DARPA Urban Challenge in 2007.

²³ Robert A. Moffitt, "From welfare to work: what the evidence shows", January 2002, <https://www.brookings.edu/research/from-welfare-to-work-what-the-evidence-shows/>

Fourth, the organizations could develop plans and programs to encourage the participation of underrepresented groups in the patenting system. More exposure to the patenting world through mentorship programs, symposiums, scholarships, and some other programs, will greatly promote inclusion of those underrepresented groups that otherwise will not have enough if any exposure to the patenting of inventions, neither the means to participate. Mentors and career advisors programs for example can perhaps orient women and minorities on how to access and participate in the innovation field. This is especially important as studies suggest that early exposure to same gender inventor-patentees is crucial for determining whether an individual becomes an inventor-patentee.²⁴ As a result, more people within the underrepresented groups will get to know about innovation opportunities within their reach, and having a role model to look up to may be perhaps motivating.

Finally, broadening the USPTO's patent bar exam requirements would also help overcome the barriers reducing women participation in inventions. The extension of the automatic qualification requirements for the patent bar exam by the USPTO's Office of Enrollment and Discipline may encourage more women to practice as a patent examiner, thus potentially decreasing implicit bias towards women inventors. This may make it more likely for these inventors to succeed in their patent applications.

²⁴ Office of the Chief Economist IP Data Highlights, *“Progress and Potential A profile of women inventors on U.S. patents”*, Feb. 2019 http://www.equality-of-opportunity.org/assets/documents/inventors_summary.pdf.

FURTHER EMPHASIZING CREATIVITY AND NOVEL IDEA GENERATION IN EDUCATION

To:	United States Patent and Trademark Office (“USPTO”)
From:	Grant Wanderscheid, M.Eng. Computer Engineering, 2L Law Student at Santa Clara University School of Law, Erik I. Perez, 2L Law Student at Santa Clara University School of Law
Date:	February 4, 2021
Re:	Comments Regarding the National Strategy for Expanding American Innovation, Docket No.: PTO-P-2020-0057

Question Addressed

II.7 - Research has shown that “invention education”—the infusion of transdisciplinary education in problem identification and problem solving—is critical to developing innovation skills in learners. How can educational institutions at all levels (prekindergarten through post-graduate) successfully infuse concepts of invention, entrepreneurship, and intellectual property education into curricula?

Short Answer

Implementing structural and pedagogical changes within educational institutions, through and along with, increasing focus on creativity and novel idea generation are ways the PTO and the executive can infuse concepts of invention, entrepreneurship, and intellectual property education into curricula.

The USPTO states “Research has shown that ‘invention education’—the infusion of transdisciplinary education in problem identification and problem solving—is critical to developing innovation skills in learners.” The USPTO requested comments be submitted regarding how educational institutions at all levels (prekindergarten through post-graduate) could successfully infuse concepts of invention, entrepreneurship, and intellectual property education into curricula. The goal is to find a strategy that can be implemented to increase the demographic, geographic, and economic inclusion of the US innovation ecosystem.

Demographic, geographic, and economic inclusion are important considerations to consider when aiming to increase the overall diversity of those involved in the US inventorship process. Whether it be inventors, patent agents, patent examiners, or patent attorneys, all have the ability to further increase the quantity and quality of innovation in the patent system. The importance of innovation was the central purpose of establishing the PTO since the Constitution highlighted the importance of innovation to our nation. Understandably, pivoting and focusing on specific goals is part of the constant reflection required in pursuit of maximizing innovation.

The recent societal focus on increased diversity, in the many forms it can take, is one such important way to increase our patent system's innovative efficiency and needs serious consideration if it is to make the improvements sought. Minor course corrections in the present can have a drastic impact over time. This is one of the reasons we believe changes in the curriculum of young children and young adults can be so beneficial and have such a big impact down the line. This comment focuses on two aspects regarding how educational institutions can infuse these critical concepts into education curricula. First, changes in any educational setting to create an increased focus on creativity and idea generation. Second, changes in STEM education to infuse innovative and entrepreneurial skills.

1. Changes to existing curricula can emphasize focus on creativity and idea generation

A California College of San Diego blog post relating to creative thinking skills reinforced the idea that just as physical muscles in our body need to be exercised to further develop so do our creativity muscles.¹ The notion of exercising and developing our creativity with thoughtful actions can coexist within the framework of existing educational curricula. For example, Dr. Robert Epstein, a psychologist and leading creativity and innovation researcher, identified four areas of focus which improve creative thinking and novel idea generation.² The Creativity Research Journal conducted a study reinforcing Dr. Epstein's research and concluded the four creativity focus areas increased employees' rate of generating new ideas by 55% within an eight-month time period.³ Further, results showed over \$600,000 in additional revenue and savings of around \$3.5 million through cost reductions resulting from new employee innovations.⁴ The four areas of focus Epstein's result have shown to boost creativity are focused on capturing new ideas, seeking out challenging tasks, broadening knowledge, and surrounding individuals with interesting things and people.⁵

The following sections elaborate on Epstein's four creativity focus areas and are followed by example assignments already commonly used.

A. Capture new ideas

Capturing ideas can be beneficial whether those ideas are of use right now or may never be of direct use. Effectively preserving ideas without judgment or editing can be extremely beneficial to the process of increasing creativity.⁶ Just by preserving ideas that come to mind (through writing it down or storing them in any other retrievable form) or forcing idea generation about anything gets the creative juices flowing and has shown to be beneficial in the creative

¹ California College San Diego, *5 Tips to Improve Your Creative Thinking Skills* (Mar. 8, 2018), <https://www.cc-sd.edu/blog/5-tips-to-improve-your-creative-thinking-skills>.

² Marianne Stenger, *Can We Learn to Be More Creative?* (June 18, 2018), <https://www.opencolleges.edu.au/informed/features/can-learn-creative/>.

³ Amy Novotney, *The Science of Creativity*, <https://www.apa.org/gradpsych/2009/01/creativity>.

⁴ *Id.*

⁵ *Id.*

⁶ Stenger, *supra* note 2.

process.⁷ Further, this was shown by Epstein to be the most effective of the four focuses in fostering creativity and novel ideas.⁸

B. Seek out challenging tasks

Attempting challenging tasks is good for many things, one of which is creativity. By taking on challenging tasks, that may or may not have a real or good solution/answer, thinking about the possibilities requires the use of creative thinking to help generate new ideas.⁹ Further, just by getting out of a comfort zone, studies have shown new ideas are created by necessity.¹⁰ Newly created ideas in turn can later be used when coming up with solutions or to open someone's eyes to a problem they are able to solve.

Further, it seems that many children like and/or are good at certain subject matters more than others. Some students may find it easier to build an idea they are thinking of, whereas some may find it easier to draw it, and some may find it easier to write about it. All these forms can be used in various learning environments to push students who lean towards one preference or another to help expand their creativity in other directions they would not otherwise be likely to focus on without the extra incentive.

C. Broadening knowledge

Just as the above section alluded to, gaining knowledge in various subject areas allows for a bigger breadth of knowledge to be pulled from and interconnected, which is the basis for creative thought.¹¹ Broadening knowledge can take the form of attending certain classes, reading new and different articles, journals, books, watching documentaries or YouTube videos on certain topics, or listening to popular podcasts that interview experts from various fields. Many existing forms of content can easily be included in curricula. Much of the content is also meant to create further interest in the subject matter and be informative to someone who is not familiar with the subject matter. For example, many of the most popular podcasts bring in guests and talk with them about their lives and careers. Encouraging teachers to include these learning opportunities into the curriculum can be relatively easy. Additionally, podcasts would be an easy form of homework because it only takes some time to listen to and does not require further reading or heightened attention to be completed.

D. Surroundings with interesting people and things

Similar to the second and third focus areas, by broadening experiences and knowledge through immersion in various forms of physical and social stimuli, the creation of original ideas

⁷ California College San Diego, *supra* note 1.

⁸ Stenger, *supra* note 2.

⁹ *Id.*

¹⁰ California College San Diego, *supra* note 1.

¹¹ Stenger, *supra* note 2.

is catalyzed.¹² This could look like talking and working with new people on projects in class. It could also look like visiting different places such as museums or even decorating your workspace differently with unusual objects, which could be fun for small children.¹³

E. Physical well-being

In addition to the research done by Dr. Epstein, physical health can influence creativity. Whether through sports on the playground, physical education, the gym, or walks, mental and physical breaks in the day are not a waste of time. Instead, these physical breaks foster effective learning.¹⁴ Physical well-being increased my confidence to learn new things, try to figure out solutions to problems, and being okay when a solution does not work out (which is part of the creative process). Physical well-being can also be further emphasized in the lives of anyone at any age to improve happiness, health, and stress levels, which in turn leads to increased creativity.¹⁵

In hindsight, given the information shared above, lots of the activities I¹⁶ have done as part of my personal engineering schoolwork have not only contributed to my overall general education, but they have also played a major part in the development of my creativity which I used throughout my childhood. Throughout my childhood, I altered toys to make them work differently such as taking air restrictors out of Nerf guns. Later on, I took apart and built computers which eventually led to me pursuing my computer engineering bachelor's and master's degree. Further, my interest in other's creative solutions is also fueling my law school trajectory towards IP law practice. Although there are already existing things proven to increase creativity in our curriculum, there is so much more that can be implemented to increase the creativity and generation of novel ideas that can take place in our educational settings.

2. Institutional structural changes in education to promote entrepreneurial development

Because entrepreneurship is a tool for economic growth and competitiveness,¹⁷ it is critical to identify entrepreneurial motivations so policy-makers can create and implement beneficial policies to support growth and competitiveness.¹⁸ "How to make students more entrepreneurial is probably the most difficult and important question in this domain."¹⁹ Commentators indicate

¹² *Id.*

¹³ *Id.*

¹⁴ Tracey Burns, *Is Physical Health Linked To Better Learning?*, OECD Education & Skills Today (Feb. 21, 2018), <https://oecdeditoday.com/is-physical-health-linked-to-better-learning/>.

¹⁵ Amy Novotney, *supra* note 3.

¹⁶ This section is from the perspective of Grant Wanderscheid, a former computer engineering student.

¹⁷ Pedro Parreira, et al., *Entrepreneurship in Higher Education: The Effect of Academy, Motivation, Resources, Incentives, and Self-Efficacy in the Entrepreneurship Potential*, INTECHOPEN (Dec. 20, 2017), <https://www.intechopen.com/books/entrepreneurship-development-tendencies-and-empirical-approach/entrepreneurship-in-higher-education-the-effect-of-academy-motivation-resources-incentives-and-self->

¹⁸ *Id.*

¹⁹ Martin Lackéu, *Entrepreneurship in Education*, ORG, FOR ECON. CO-OPERATION & DEV. 29 (2015), https://www.oecd.org/cfe/leed/BGP_Entrepreneurship-in-Education.pdf.

there are many factors that influence entrepreneurialism.²⁰ Two key factors which influence entrepreneurialism include: achievement and environment.

A. Achievement motivating entrepreneurship

The achievement drive is one of the most extensively studied motivators.²¹ When one feels like they have achieved something, they are driven to succeed more often and push the boundaries of the past. Unfortunately, academic achievement is commonly measured through examinations.²² These examinations do not take into account other skills that develop entrepreneurship.

Currently, students are only evaluated on easily quantifiable metrics. These metrics have been in place for decades and reward correct answers rather than the process. For many students, the drive to achieve high scores on tests, assignments, or classes is a primary motivation factor. But, the way to achieve standardized success does not foster creative environments.

Below, in Figure 1, are example curriculum assignments shown by research to “foster powerful learning” and are already being used in our schools.²³ Noticeably, many of the assignment types tend to be used largely in one educational setting over another (such as papers often being written in English classes and information-data projects often being used/made in science classes). The four factors discussed above suggest educational institutions should implement such expected assignments in a class that would not ordinarily expect such an assignment.

There are endless opportunities to cross over expected projects with unexpected applications. More examples include coming up with an invention and making it, or drawing what it would look like, or writing about what it would look like and how it functions. Additional examples could be as simple as having increased or decreased perceived creative freedom on certain projects to impose constraints on students and either let them choose a new topic of interest to further learn about or force them to work around limited constraints for project completion. With the four creativity focus areas in mind, along with the preexisting assignment types shown to improve learning, assignments can be used in new and various classes/settings to further emphasize the creativity and novel idea generation skills of students.

²⁰ Parreira, *supra* note 17.

²¹ *Id.*

²² Annie Ward & Howard W. Stoker, *Educational Measurement: Origins, Theories, and Explications*, 2-3 (1996), <https://archive.org/details/educationalmeasu0001unse/page/2/mode/2up>.

²³ The Association for Supervision and Curriculum Development, *Seven Types of Projects that Foster Powerful Learning* (Feb. 25, 2014), <https://inservice.ascd.org/seven-types-of-projects-that-foster-powerful-learning/>.

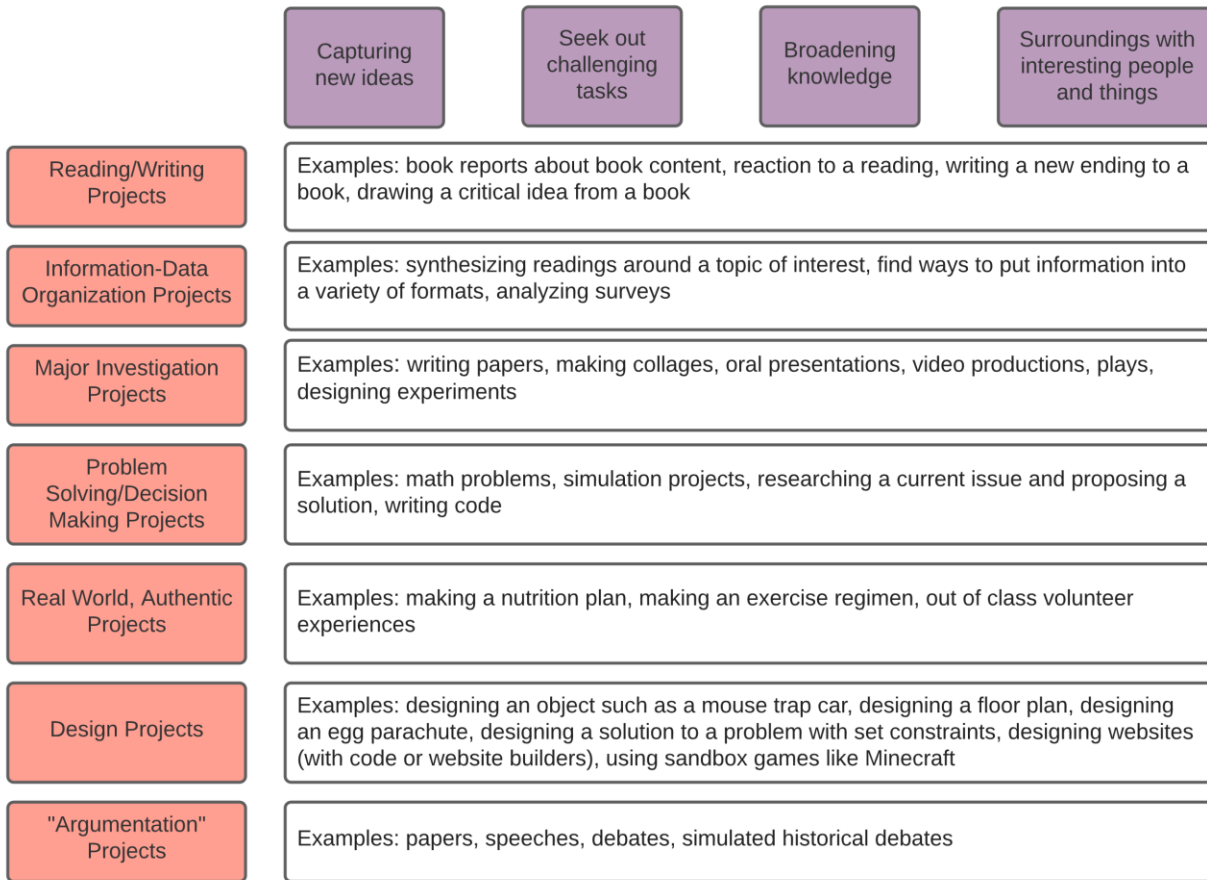


Figure 1: This figure shows example learning activities that can be paired with any of the four creativity focus areas to help emphasize creative thinking and novel idea generation in educational environments

In STEM education, the scientific method has been standardized and adopted throughout curricula. Educators have been able to dissect the scientific method into discrete parts and apply a quantifiable score to evaluate student achievement. Similar to the scientific method, commentators have described the concept of “effectuation.”²⁴ “Effectuation is described as an iterative process of decision making and active commitment seeking that results in creation of new value”²⁵ Like the generic scientific method, effectuation could be a generic method for entrepreneurship.²⁶ “Viewing entrepreneurship as a generic method holds much promise for the field of entrepreneurial education, but requires emphasis on taking action, value creation and using creativity tools.”²⁷

²⁴ Lackéu, *supra* note 19, at 42.

²⁵ *Id.*

²⁶ *Id.*

²⁷ *Id.*

In an interview with Juan Diego High School STEM teacher, Nikki Wyman,²⁸ she spoke about the fine line teachers must walk in order to implement iterative STEM curricula. In her experience, faculty members enjoy STEM laboratory experiments that are routine and outline precise steps the students must follow. Additionally, STEM educators can better quantifiably analyze the student's achievements. For students, these "cookie cutter" labs bring a situation of familiarity. Students need not worry about the seemingly infinite number of possibilities at their fingertips. In Wyman's experience, she finds students are more willing to productively engage with these simple surgical laboratory experiences and typically do not enjoy experiment repetition even if new methods are implemented.

Wyman has carefully attempted to bridge the gap between iterative processes and student enjoyment through the implementation of assignments of limited resources, where students are given limited resources - a way to reduce anxieties from seemingly infinite potentials - and where students are rewarded with more resources when they think creatively or innovatively.

In my personal experience,²⁹ straightforward laboratory experiments were commonplace among my undergraduate course work. These "cookie cutter" labs brought a sense of relief and unmistakably focused on a specific concept. Once I began taking graduate level coursework during my undergraduate education, the labs slightly changed. The labs, at their core, were still routine experiments; however, some level of personalization occurred. For example, my graduate level organic chemistry class focused on the antibiotic viability of different organic compounds. My lab partner and I had to pick a certain molecule from a predetermined list. The methods between each compound were roughly the same. Yet, we had to specific ratios of inorganic to organic solvents when purifying the compounds, we had to perform different spectral analysis, and we had to use slightly different chemicals during synthesis. These types of assignments created more challenging environments and created more innovative students.

However, it is difficult to implement this type of curricula. The Professor had to monitor eight different reactions occurring simultaneously for a sixteen person laboratory. As class size grows, the harder it becomes for any instructor to monitor the environment and to ensure each student is succeeding and learning. Understandably, educational institutions hesitate to adopt these types of metrics. It can be difficult to standardize an approach that can not be consistently applied to all students. Nevertheless, a paradigmatic shift towards achievement through failure or through entrepreneurship during informative years can shape how individuals view achievement and ultimately success.

Additionally, achievement can occur through motivating factors outside of grades. Because innovation can be tied to economic structures of capitalism, achievement could be tied through the structures of capitalism. As explained above, students could be given limited

²⁸ Telephone Interview with Elizabeth N. Wyman, High School STEM Teacher, Juan Diego Catholic High School (Jan. 24, 2021) (Wyman's preferred name is Nikki instead of Elizabeth).

²⁹ This section is from the perspective of Erik Perez, a former chemistry and mathematics student.

resources to complete a project. If the student succeeds at meeting some predetermined threshold, then they could be given more resources. This type of iterative achievement allows a student to understand their actions have consequences and are rewarded based on their innovative ideas.

B. Environmental Motivational Factors

Additionally, environmental factors constitute a motivational force to entrepreneurship. Entrepreneurship, as a social dynamic process, results from the interaction between entrepreneur, team, opportunity, idea, and available resources.³⁰ The concept of team building has become an increasing topic of conversations among researchers.³¹ “[L]etting students work in interdisciplinary teams and interact with people outside school / university is a particularly powerful way to develop entrepreneurial competencies among students.”³² “However, if this kind of experiential learning based activity is to be classified as entrepreneurial, some kind of value needs to be created for the people outside school or university in the process. It is not sufficient to just interact with outside stakeholders without a clear end result.”³³

The collegiate system has developed systems for facilitating “outside world” interaction.³⁴ Universities typically employ dedicated administrative resources to foster collaboration.³⁵ For example, Universities create “licensing and royalty agreements for research-based intellectual property, informal transfer of know-how and product development collaboration.”³⁶ Yet, students carry a limited role in these interactions.³⁷ “There is almost no overlap between research on entrepreneurial education and research on technology transfer.”³⁸ At the collegiate level, institutions can foster these types of interactions by employing initiatives to assist students with inter-university collaboration.

Given the advanced structure of the collegiate system, primary and secondary education systems can learn and benefit from the success.³⁹ Primary and secondary educational institutions can foster collaborative environments across schools. Collaboration between schools will likely become increasingly easier because of the implementation of virtual technology. Schools may be able to create virtual meeting rooms and foster cooperation and collaboration through those means. While the USPTO cannot change educational standards, the executive branch as a whole could implement policies or grants that rewards these educational standards.

³⁰ Parreira, *supra* note 17.

³¹ Lackéu, *supra* note 19, at 7.

³² *Id.*

³³ *Id.*

³⁴ *Id.* at 33.

³⁵ *Id.*

³⁶ Lackéu, *supra* note 19, at 33.

³⁷ *Id.*

³⁸ *Id.*

³⁹ *Id.*

3. Conclusion

The USPTO has the ability to affect change in the curriculum of the schools. The reinforcement of increased focus on creativity, novel idea generation, and structural and pedagogical changes within educational institutions are ways the PTO and the executive can support the PTO's goal. This prompted response can be used to help guide future alterations to our school systems and to identify what is worth increased focus in schooling those that benefit from the environments also are maximally infusing concepts of invention, entrepreneurship, and intellectual property into their education. By making these changes in any and/or every stage of the curriculum a person experiences, there will be positive effects on the creativity and novel idea generation that will pay off big time.

GROWING AWARENESS AND INNOVATION IN RURAL AND DISADVANTAGED COMMUNITIES

To:	United States Patent and Trademark Office (“USPTO”)
From:	Matthew Carter, 2L Law Student at Santa Clara University School of Law Garrett Pierson, 2L Law Student at Santa Clara University School of Law
Date:	February 4, 2021
Re:	Comments Regarding the National Strategy for Expanding American Innovation, Docket No.: PTO-P-2020-0057

Question Presented

II.8 - To supplement formal education, how can community institutions, particularly in rural and economically disadvantaged areas, build awareness of, and skills and interests in, invention, entrepreneurship, and intellectual property among students of all ages?

Short Answer

Innovation and participation in the patent system in rural communities can be improved by looking at the relationship between education and opportunity. Rural areas often require improvement to the infrastructure of their tech-based economies. Such improvements can be better guided and tuned to fit the areas which need them most by increasing research into what forms of education are leading young people in these rural areas towards or away from tech-based careers in these rural areas.

The USPTO has asked how community institutions, particularly in rural and economically disadvantaged areas, build awareness of, and skills and interest in, invention, entrepreneurship, and intellectual property among students of all ages.

Currently, the USPTO provides resources to assist disadvantaged inventors, such as reduced fees and the pro bono program, but these resources can only accomplish so much when these disadvantaged communities are unaware or uninformed of them. A simple way to inform disadvantaged inventors is increase and improve the marketing of pro bono programs at community institutions. An improved method of not simply informing inventors of the pro bono system but also educating inventors on the advantages and procedures of the patent system would encourage inventors to seek patent protection.¹

¹ Poverty and Patents: *Intellectual Property Policy and Economic Inequality*. Wenkai Tzeng. Indiana University Maurer School of Law (May. 2017), <https://www.repository.law.indiana.edu/cgi/viewcontent.cgi?article=1067&context=ijlse>

There are two main approaches to improving awareness in disadvantaged communities. First, is to inspire and interest children in inventorship. Second, is to grow community opportunity and education projects to help inventors in need of help.

THE NEXT GENERATION OF INVENTORS

The first step in solving the issue of inequality in innovation is research. Communities and schools should be surveyed to see what resources are already available in disadvantaged and rural communities, and if there are resources available, which ones are most effective.

There is a great correlation between exposure to inventors and inventorship as a child and young adult to inventorship as an adult. The level of exposure to innovation during childhood appears to be the most determinative factor in who becomes an inventor. This is because most children adopt role models and aspire to achieve the accomplishments of their models. It then follows that children with more availability to inventors will be more likely to adopt these inventors as their role models. Therefore, to naturally increase the interest in innovation in these disadvantaged areas, the USPTO should strive to encourage the availability of inventors to children in disadvantaged areas.

The simplest way to provide children with access to inventors is to encourage inventor outreach programs to schools and other community institutions in disadvantaged areas. If children have the ability to interact with inventors and learn more about entrepreneurship and intellectual property, they will naturally become more interested and be more likely to become inventors and entrepreneurs when they reach adulthood. It is also advantageous to tailor these programs to match with the backgrounds of the communities being targeted. A child is more likely to be influenced by a role model if the role model has a similar background.²

Inventors and entrepreneurs are largely located in cities, so this strategy may not be feasible for some rural students. A better communication network between rural communities and schools would most benefit the fostering of rural innovation.³ If rural communities are better connected to one another, rural students will have better access to the sparsely populated rural innovators that they could take inspiration from. In addition, a more connected rural America would allow the collaboration and share of ideas that is often necessary for invention and innovation.

The best way to make disadvantaged and rural communities aware of the opportunities and develop an interest in invention, it is best to start with future members of the communities.

² Who Becomes an Inventor in America? *The Importance of Exposure to Innovation*. Alex Bell, Harvard University. (Nov. 2018). http://www.equality-of-opportunity.org/assets/documents/inventors_paper.pdf

³ Generating Opportunity and Prosperity: *The Promise of Rural Education Collaboratives*. BattelleforKids.org (2016). <https://www.esmec.org/generatingopportunityprosperityview.pdf>

If children are exposed to careers in entrepreneurship, innovation, and intellectual property, they will be more aware of the career paths available to them.

CURRENT INVENTORS IN NEED

Inventors who live in disadvantaged and rural communities lack access to the resources necessary to make their inventions protectable and their ideas successful. This includes inventors being unaware of the patent system, not understanding the scope of patentable material, being dissuaded by the price of patent prosecution, aversion to sharing their ideas with attorneys, and generally not knowing where to begin in applying for a patent. The USPTO should strive to assist inventors in navigating these obstacles.

The first two issues reside in a general unawareness of the intellectual property system. This problem can simply be solved by offering resources to the public allowing them to educate themselves. While the logical starting point for an inventor seeking protection for their intellectual property would be the USPTO website, many are intimidated by the site itself. If one visits the USPTO website, clicks on “Patents,” and then on “Patent basic,” they are greeted with a massive thirty-six page long webpage covering everything from the technicalities of what can and cannot be patented, the fees required, and how to draft claims. While placing all the information in one place may be easy and efficient, a more approachable and instructive method of providing inventors with information would be of great benefit.

Potential patentees are often dissuaded by the prices often listed online by patent prosecutors. The patent prosecution process is often an expensive ordeal, and the cost estimates listed on the internet are enough to make even already well-off inventors shy away. One way to reduce this cost for these inventors is to expand the qualifications for reduced fees. Another is to provide more pro se prosecution resources to potential inventors such as videos or instructions for drafting an effective application.

Inventors are also often skeptical of sharing their ideas and inventions with others, including attorneys, for fear of someone stealing or copying their idea. While it may be wise for inventors to not share their invention with others, an inventor should be able to trust their attorney. Most of this distrust comes from the general negative reputation of lawyers in our society, and only quality and honest work can fix that problem. If the USPTO and community institutions share information about and guide inventors toward local patent attorneys, they would likely be more trustworthy. Such information could easily be included with the general awareness programs.

As mentioned previously, one of the primary obstacles in rural areas is that even if there is sufficient innovation education during childhood, most of the positions that provide innovation opportunities are located in metropolitan areas rather than rural areas. This greatly dissuades people from rural areas from even considering such career paths. Rural areas are not lacking in people who are capable and willing to enter these fields. However, they are severely lacking in the means to allow such people to remain in the rural areas while pursuing such fields.

One promising solution to this problem has been put forward by the Center on Rural Innovation (CORI). CORI has begun to implement what they call a Digital Economy Ecosystem Model which is designed to create innovation based on tech-enabled job opportunities.⁴ The primary idea behind this model is to develop an “ecosystem” or infrastructure of job opportunities in fields that regularly produce patents and innovation. Investing in what CORI calls Innovation Hubs⁵ would allow people living in rural areas the opportunity to seek meaningful employment in innovative fields without having to move to a big city or another state. By investing in growing the rural infrastructure of innovation, CORI has put forward an idea that can increase opportunity and therefore willingness to participate in innovation and patenting.

Increasing the level of opportunity in the same or similar ways that CORI has begun to do is vital to grow the innovation economy in rural areas. Without the presence and awareness of such opportunities, potential innovators are more likely to be dissuaded from pursuing certain career paths that lead to innovation and seeking patents, or they will be persuaded to leave their rural homes. Providing rural opportunity and awareness of such opportunity will increase people’s willingness to pursue innovation based and tech-enabled careers within their rural communities. Such opportunities will allow innovators to prosper personally, all while giving back to their own community.

This solution compounds with the earlier discussed topic of the importance of exposure to innovation. If rural communities begin to see a rise in opportunity and from that an increase in local innovators and innovation hubs, there will naturally be more exposure to innovation and innovators. Allowing Innovation to be considered close to home in rural communities will increase interest in children's understanding and begin to pursue their own innovation education.

Conclusion

This combination of increased research into innovation education in rural areas and investment into innovation opportunity in rural areas will allow for the start of a self-sustaining economy of innovation in rural areas. Discovering through research the ways in which young innovators are encouraged and the ways in which they are discouraged will inform and improve the implementation of such a movement to increase the infrastructure of innovation in Rural areas.

⁴ Center on Rural Innovation (CORI), (2019). <https://ruralinnovation.us/rural-innovation-initiative/our-model/>

⁵ CORI, supra note 4.

STRATEGY FOR AMERICAN INNOVATION: EDUCATION PROGRAM FOR HIGH SCHOOL TEACHERS

To:	United States Patent and Trademark Office (“USPTO”)
From:	Sung Lee, 3L Law Student at Santa Clara University School of Law, Dr. Nazli Rahim, Ph.D. Genetics, 3L Law Student at Santa Clara University School of Law
Date:	February 4, 2021
Re:	Comments Regarding the National Strategy for Expanding American Innovation, Docket No.: PTO-P-2020-0057

Question Presented

II.9 - More can be done to help teachers, even those with a formal science, technology, engineering, or mathematics (STEM) background, incorporate concepts of innovation into their teaching methods. What new or existing professional development opportunities, resources, and programs could train teachers to incorporate invention education concepts into their instruction? How could these efforts be leveraged and scaled so that similar resources and opportunities are accessible to all teachers?

Short Answer

Collaborating with the U.S. Department of Education to utilize the platform established by Teacher Incentive Funds, expanding the USPTO’s National Summer Teacher Institute program to more teachers, and collaborating with existing teacher training programs

Innovations occur at a never before seen rates in our Information Technology era. With easy access to big data and powerful cloud computing resources, people from all over the nation are developing novel ideas, processes, methods, and machines every day. Some of the ideas and inventions get patented, but it is often the case that most never make it to the application step for various reasons.

For more inventions to get patented, we believe that helping people to obtain the skills and develop the interests necessary to become innovators, problem solvers, and entrepreneurs is important, and helping teachers to incorporate concepts of innovation into their teaching methods is one of the most effective ways in promoting invention education.

Invention education is an emerging field, and policymakers and curriculum designers are striving to provide teachers with novel approaches to incorporate the teaching of innovation into

current pedagogical methods. The USPTO should invest in the field to further broaden and enable the teacher's participation in bringing invention to the class.¹

Utilizing Teacher Incentive Funds

Collaborating with the United States Department of Education to create an incentive-based program for teachers can improve the incorporation of innovative concepts in teaching methods. The Teacher Incentive Funds program by the United States Department of Education provides funds for projects that develop and implement performance-based teacher and principal compensation systems in high-need schools. The program aligns well with the USPTO's goals because one of the program's purposes is to expand the array of promising approaches that can help educators.²

By collaborating with the program, the USPTO can utilize the program's networks and strategies to publicize the USPTO's goal of promoting innovative concepts in teaching methods. Since 2010, the program has funded more than 100 projects that have served over 2,000 schools in more than 300 urban, suburban, and rural school districts in 36 states and Washington, D.C.³ The applicants and the grantees of the program have been large organizations such as school districts, county public schools, city departments of education. The largest funding was awarded to the Louisiana Department of Education in 2016, which granted more than 66 million dollars. Therefore, the collaboration will not only capture the interest of large school organizations but also motivate their participation.

Expanding and Publicizing Teacher Training Programs

The USPTO has been hosting the National Summer Teacher Institute (NSTI) to promote the goal of helping teachers incorporate concepts of innovation into their curricula.⁴ The program is, however, limited in capacity and requires certain prerequisites that can have detrimental effects.

First, the program's requirement of at least three-year teaching experience in the field of STEM can be detrimental to the purpose of the program because the new teachers are the ones who can make the best use of the program. The newly hired teachers oftentimes do not yet have developed a specific method of teaching and because of their lack of experience, it will be much easier for them to incorporate the concepts of science and technology into their teaching. On the contrary, it will take much more time and effort for experienced teachers to incorporate new ideas or curricula into their methods. Therefore, it is critical that such opportunities are made available to newly hired teachers as well.

¹ Helen Zhang, *Technology and innovation*, Vol. 20, pp 235-250, 247, 2019.

² *Teacher Incentive Fund*, U.S. Department of Education (Apr 28, 20), available at <https://www2.ed.gov/programs/teacherincentive/index.html>.

³ *Id.*

⁴ *Office of Education*, United States Patent and Trademark Office, available at <https://www.uspto.gov/learning-and-resources/outreach-and-education>.

Second, the program should be open to all interested teachers rather than those who teach the STEM courses or have experiences in mentoring students in areas directly related to invention, innovation, making, or entrepreneurship. Sometimes, having in-depth knowledge does not necessarily translate into teaching, and it is not difficult to find great teachers who come from outside of the field. Also, with rapidly developing technology, people are learning and developing their fields of interest in science and technology. One can easily find people who are professionals in the field who did not acquire a college diploma. Moreover, people who are more prone to accepting and incorporating new inventions and innovations are oftentimes ones who have great interests in the field. Thus, opening up the opportunity to not only teachers in the field of STEM but also to those who have an interest in the field would be a positive change to the current program.

Third, the USPTO should host the program both in-person and online for greater participation and accessibility. There is no doubt that the program would be much more effective in-person. However, with developing technology and with the possibility of pandemics such as one that we are experiencing currently, both options should be provided. Hosting the program online will draw more participation from the teachers who are interested in the program. Also, it will provide opportunities for those teachers in remote areas who would have been interested in the program. Over time, an archive of discussions held online can provide valuable data for others to develop their unique ideas as well.

Lastly, the USPTO should consider offering the program to colleges and universities as well. The students in universities can have practical benefits from participating in the offered programs. They can incorporate what they have learned from the programs to their studies or for those who are interested in teaching, they can start to develop such ideas even before they start their career in education.

Collaborating with Existing Teacher Training Programs

In addition, the USPTO can have a broad impact on the training of teachers by partnering with existing teaching education programs to incorporate invention education. This can be accomplished by partnering with STEM-focused teacher training programs and by collaborating in the development of student STEM curricula to include the concepts of inventing and innovation.

The USPTO should also provide resources designed to be accessed directly by current STEM-focused teacher training programs. For example, the National Science Foundation funds a Research Experience for Teachers⁵ program that supports middle and high school teachers in developing research-based curriculum for STEM classrooms. Participating teachers conduct a research project at an affiliated lab to develop curricula that showcases the real-world impact of

⁵ *Research Experience for Teachers*, Center for Neurotechnology, available at <http://www.csne-erc.org/content/research-experience-teachers>.

STEM. By partnering with such established programs, the USPTO can exploit the current channels of STEM teacher training to reach more teachers, and to extend teacher STEM education to include invention education.

Throughout their careers, teachers are also routinely subject to continued training to implement new advances in science and math curricula in the classroom. The USPTO should partner with current programs that train teachers in implementing new classroom curricula to integrate invention education with STEM coursework. For example, in the heart of Silicon Valley, the Palo Alto school district has switched its science curriculum to Amplify Science. Developed in partnership with UC Berkeley's Lawrence Hall of Science, the curriculum is described as combining "hands-on investigations, literacy-rich activities, and interactive digital tools to empower students to think, read, write, and argue like real scientists and engineers."⁶ The "phenomenon-based" curriculum provides teachers with in-depth lesson plans to enable students to engage in real-world scientific problem solving. The program is structured so that students complete weeks-long "internship" units, such as working as food engineer interns, tasked with creating a nutrition bar to be used during natural disasters, or engineering interns, developing a tsunami alert system. Training for middle school teachers began in the spring of 2020 and continued over the summer, with teachers meeting to create a shared curriculum and learning targets⁷. With such an innovative curriculum, the USPTO could easily provide additional resources and instructional strategies for teachers to complete such lessons with a discussion of invention and the patent process, in addition to providing examples of real-world patents directed to these technologies.

As educational goals evolve, and teachers are trained to effectively apply newly developed teaching methods, education with regards to invention education should evolve as well. The USPTO should endeavor to modify current STEM curricula and teacher training to successfully integrate invention education into school curricula.

Scaling Resources and Opportunities to all Teachers

Of course, adequate resources in invention education may not be equally available to all teachers or all school districts, and even those that do have the requisite resources and capacity may be unaware of opportunities. The USPTO can play an important role in promoting invention education to teachers, thereby enabling such programs to expand to more schools to reach more teachers.

By expanding programs such as the USPTO's National Summer Teacher Institute to reach more teachers, both by extending to non-STEM teachers and providing the program both in-

⁶ *A new phenomena-based curriculum for grades K-8*, Amplify Education, Inc., available at <https://amplify.com/programs/amplify-science/>.

⁷ Elena Kadwany, *News With current textbooks 'obsolete,' Palo Alto's middle schools to get new science materials*, Palo Alto Online (Feb. 26, 2020), <https://www.paloaltoonline.com/news/2020/02/24/with-current-textbooks-obsolete-palo-altos-middle-schools-to-get-new-science-materials>.

person and online, the USPTO will have a wider reach to offer opportunities to more teachers. These teachers will take back what they've learned to their colleagues and schools. Furthermore, by targeting teachers through existing teacher training programs and through teacher training in new STEM curricula, the USPTO can reach a more diverse set of teachers. Finally, providing learning opportunities for teachers that expand their knowledge of how scientific concepts can be extended to invention will enable them to inspire students to invent.

HOW TO SUPPORT INCREASING RATES OF INVENTION, ENTREPRENEURSHIP, AND RECRUITMENT OF UNDERREPRESENTED GROUPS

To:	United States Patent and Trademark Office (“USPTO”)
From:	John DiBaise, 3L Law Student at Santa Clara University School of Law Michael Costello-Caulkins, 3L Law Student at Santa Clara University School of Law Anonymous, 3L Law Student at Santa Clara University School of Law
Date:	February 4, 2021
Re:	Comments Regarding the National Strategy for Expanding American Innovation, Docket No.: PTO-P-2020-0057

Question Presented

III.10 - Recent progress in developing STEM graduates from underrepresented groups has been documented. How can similar rates of invention and entrepreneurship be attained? How can organizations best recruit and retain innovators from diverse backgrounds?

Short Answer

Increasing rates of invention, entrepreneurship, and recruitment of underrepresented groups may be obtained by promoting diversity among leadership roles in companies, establishing mentorship programs to assist STEM degree completion rates, and continuing to educate individuals about the United States patent system by participating in virtual career fairs.

The USPTO should attempt to promote diversity among leadership roles in companies. To accomplish this, the USPTO can draw on recent progress made in developing STEM graduates by supporting early career development through exposure to innovation and mentorship. Additionally, the USPTO can continue to expand their outreach to underrepresented communities to educate individuals about the United States patent system. In developing these solutions, the authors draw on their personal and industry experience as engineers as well as research of internet and scholarly sources. The authors also have interned at law firms dealing with both patent litigation and prosecution-related matters.

As an anecdotal example, in 2017, the fashion industry saw women receiving 87.9 percent of the degrees from the top 5 fashion and apparel design universities.¹ Yet, a 2015 survey found that, of 50 global fashion brands, only 14 percent were run by a female executive.² Similarly, according to a 2019 report by the Association for Women in Science, only “roughly 4 percent of

¹ *Gender Imbalance for Common Institutions*, Data USA (accessed Feb. 1, 2021), https://datausa.io/profile/cip/fashion-apparel-design#enrolled_gender.

² Vanessa Friedman, *Fashion’s Woman Problem*, The New York Times (May 20, 2018), <https://www.nytimes.com/2018/05/20/fashion/glass-runway-no-female-ceos.html>.

STEM leadership roles are held by women of color and 22 percent by white women.”³ So, while diversity efforts amongst STEM graduates may be laudable, those efforts may not effect significant change in inventorship rates until the diversity in the **leadership** of STEM occupations changes.

One reason why this lack of diversity in STEM leadership roles leads to lower inventorship may be due to the classification of who is an “inventor.” According to the MPEP, “[t]he threshold question in determining inventorship is who conceived the invention. Unless a person contributes to the **conception** of the invention, he is not an inventor.”⁴ Therefore, “[i]nsofar as defining an inventor is concerned, reduction to practice, per se, is irrelevant.”⁵

But in technology companies, young engineers are not always afforded the opportunities to participate on projects with this “inventorship” potential. For example, the technology company one of us worked for followed a tiered model. Young engineers with bachelor’s degrees started in associate engineering positions with responsibilities that included component and test apparatus design (within the mechanical group). It was not until year five that those engineers were staffed on projects that garnered more recognition. Even still, projects with patent potential were reserved for engineers with at least ten years of experience, and more commonly, for engineers who had been at the company for over twenty years. Additionally, many of the patents began within a single research and development team that staffed at most five engineers with advanced degrees. So, as it stands, in order for a young engineer to reach a role with inventorship potential, they likely need to persist in their roles until they gain the seniority or technical proficiency to be included on patentable projects.

In order to boost diversity among STEM leadership roles, we believe that the USPTO can employ similar tactics that have led to the recent progress in developing STEM graduates from underrepresented groups. The focus of recent progress has been on improving degree completion rates in STEM fields.⁶ Research has shown that underrepresentation is more attributable to lower persistence rates among racial and ethnic minorities in science engineering than a lack of interest.⁷ One recent study has shown that racial disparities in science achievement are mainly attributable to unequal preparation and access to educational opportunities.⁸ Among the unique college experiences that can make a significant positive difference in STEM degree attainment include undergraduate research program participation, joining a club or organization related to their major, relieving students of the burden of working full-time, and faculty

³ Aspen Russell & Heather Metcalf, *Transforming STEM Leadership Culture*, Association for Women in Science (accessed Feb. 3, 2021), available at <https://www.awis.org/leadership-report>.

⁴ Manual of Patent Examining Procedure (“MPEP”) § 2109, 9th ed., rev. 10.2019 (June 2020) (citing *Fiers v. Revel*, 984 F.2d 1164, 1168 (Fed. Cir. 1993)) (emphasis added).

⁵ *Id.*

⁶ Mitchell J. Chang, *What Matters in College for Retaining Aspiring Scientists and Engineers from Underrepresented Racial Groups*, 51 J. Res. Sci. Teaching 555 (May 2014).

⁷ *Id.*

⁸ *Id.*

mentorship (to the extent it is associated with faculty research).⁹ Particular emphasis is placed on undergraduate research opportunities which increases underrepresented minority student's chances of obtaining a STEM degree by 17 percent.¹⁰ This is so significant because research opportunities allow students to feel more personally connected with their STEM field and identify as scientists.¹¹ Similarly, mentorship, particularly research mentorship, plays a critical role in forming a science identity.¹² Research mentors are not only uniquely positioned to advise students and support them in pursuing independent work and their research goals, but students with research mentors found those relationships to be stronger overall.¹³ As one student put it, "[My research mentor] is somebody who I know is pushing me, who's behind me ... who's willing to put her neck out for me as a student, and she's been really supportive ... [she] helped me realize that I can do this type of work, even though I don't have much experience in it."¹⁴

Making sure underrepresented minorities persist and graduate with STEM degrees is an important first step to encourage innovation from diverse backgrounds. This can be done in a number of ways including providing students in their undergraduate years with more extracurricular opportunities to engage in their STEM field, supporting opportunities for students to "earn and learn" in STEM through paid research positions to address financial concerns of students, and provide more career guidance to underrepresented minority students to improve their willingness to work toward their degree.¹⁵ Businesses will need to hire more underrepresented students in science and engineering positions, and once in those positions, mentorship and exposure to innovation will play an important role in invention. Incentives could be put in place for industries to hire more underrepresented minorities on team projects with patent potential.¹⁶ Similarly, incentives could be implemented for businesses to continuously support and mentor in patent heavy fields where women and ethnic/racial minorities are underrepresented.¹⁷

Another way in which invention and entrepreneurship from underrepresented groups may increase is by educating individuals within these groups about the United States patent system. The USPTO provides a variety of outreach events across America through their regional offices¹⁸ as well as through their Office of Education.¹⁹ However, while the USPTO is active on

⁹ *Id.*

¹⁰ *Id.*

¹¹ *Id.*

¹² Kaitlin Atkins et al., "Looking at Myself in the Future": How Mentoring Shapes Scientific Identity for STEM Students from Underrepresented Groups, *Int'l J. of STEM Educ.* 42 (Aug. 2020).

¹³ *Id.*

¹⁴ *Id.*

¹⁵ Chang, *supra* note 80.

¹⁶ Stephanie R. Couch and Leigh B. Estabrooks, *Policy Initiatives Needed to Foster Female Inventors' Contributions to U.S. Economic Growth*, Lemelson-MIT Program (June 29, 2020).

¹⁷ *Id.*

¹⁸ USPTO locations, (April 20, 2020), accessed Feb. 2, 2021, <https://www.uspto.gov/about-us/uspto-office-locations>.

¹⁹ Office of Education, (Sept. 30, 2020), accessed Feb. 2, 2021, <https://www.uspto.gov/learning-and-resources/outreach-and-education>.

social media by having Twitter, LinkedIn, Facebook, Instagram, and email accounts, an individual would need to take a proactive step to search for these accounts to receive information about the United States patent system.²⁰ Thus, the USPTO is now in a great position to use virtual outreach methods to make more individuals aware of the United States patent system while recruiting innovators from diverse backgrounds.

The USPTO is already recruiting through virtual career fairs.²¹ And the USPTO already provides monthly IP Workshops for K-12 educators to help integrate invention activities into the classroom.²² However, with career fairs moving to virtual settings, the USPTO and other organizations are in unique positions where they are not limited by travel costs to participate in virtual interviews from all 50 states, the District of Columbia, and territories. Virtual interviewing has led to a larger pool of applicants and savings in time and expenses.²³ Virtual interviews also have the opportunity to be conducted without video to minimize the chance of bias.²⁴ While registration costs may prohibit the USPTO or other organizations from participating in all of the institutions' virtual career programs, hiring needs may dictate which institutions the USPTO or other organizations should target in their recruitment.

For example, there are currently more than 200 American institutions²⁵ offering an accredited bachelor's degree in Computer Engineering. Yet, this amount is less than the approximate 330 American institutions²⁶ offering an accredited bachelor's degree in Mechanical Engineering. Therefore, the USPTO and other organizations may want to consider participating in virtual career fairs at institutions that offer a wide variety of STEM degrees as well as at institutions with large student bodies to have a higher probability of reaching potential future inventors from diverse backgrounds.

Just by having the USPTO participate in virtual recruitment events, however, may result in individuals taking the necessary, proactive step to seek out additional information about

²⁰ Join us, (September 24, 2020), accessed February 2, 2021, <https://www.uspto.gov/jobs/join-us>.

²¹ USPTO, (January 2021), *Students, join #USPTO recruiters at nearly 30 upcoming virtual career fairs! Next week find us at: Georgia Institute of Technology* [Image] [Post]. LinkedIn. https://www.linkedin.com/posts/uspto_uspto-usptojobs-careerfairs-activity-6758398397968850944-G2VO.

²² USPTO, (January 2021), *Do you know an educator interested in integrating #IP, invention, and innovation activities into the classroom? The USPTO offers a* [Image] [Post]. LinkedIn. https://www.linkedin.com/posts/uspto_ip-expandingamericaninnovation-activity-6758458590060679168-AGqI.

²³ Jewkes, M. D., Swinton, J. J., Cromwell, S., Schramm, D. G., & Brower, N. (2021), Remote Hiring Innovation During the COVID-19 Pandemic. *Journal of Extension*, 58(5), available at <https://tigerprints.clemson.edu/joe/vol58/iss5/8>.

²⁴ Sternberg, Kevan, et al. (2020), Reimagining Residency Selection: Part 2—A Practical Guide to Interviewing in the Post-COVID-19 Era. *Journal of Graduate Medical Education*, 12(5), available at <http://dx.doi.org/10.4300/JGME-D-20-00911.1>.

²⁵ ABET Accredited Programs, (Oct. 1, 2020), accessed Feb. 2, 2021, <https://amspub.abet.org/aps/category-search?disciplines=48°reeLevels=B&countries=US> (post processing script used to filter for only accredited degrees titled "Computer Engineering").

²⁶ ABET Accredited Programs, (Oct. 1, 2020), accessed Feb. 2, 2021, <https://amspub.abet.org/aps/category-search?disciplines=48°reeLevels=B&countries=US> (post processing script used to filter for only accredited degrees titled "Mechanical Engineering").

America's patent system and boost American entrepreneurship. For this reason, the USPTO may want to provide an annual online job posting through at least one institution with the highest enrollment in every state²⁷ (if the USPTO does not already do so in addition to posting on usajobs.gov) while also continuing to participate in virtual career fairs.

Conclusion

The USPTO should consider promoting diversity among leadership roles in companies, establishing mentorship programs to assist STEM degree completion rates, and continuing to educate individuals about the United States patent system by participating in virtual career fairs in order to increase rates of invention, entrepreneurship, and recruitment of underrepresented groups.

²⁷ Highest Enrollment by State (accessed Feb. 3, 2021), https://www.stateuniversity.com/rank_by_state/tot_enroll_rank/index.html.

COMMENT IN RESPONSE TO QUESTION III.11

To:	United States Patent and Trademark Office (“USPTO”)
From:	Anonymous, 3L Law Student at Santa Clara University School of Law
Date:	February 4, 2021
Re:	Comments Regarding the National Strategy for Expanding American Innovation, Docket No.: PTO-P-2020-0057

Question Presented

III.11 - Inventors thrive when cultural and institutional barriers within workplaces are minimized or removed. What are examples of these barriers, and how can organizations remove them to create an inclusive, innovative workplace culture?

Short Answer

The most likely barriers that exist within the workplace occur at the point of entry into the company, during the hiring process, and in the interactions between team members when collaborating. To remove these barriers, companies should favor a more open mindedness over efficiency, and work to create an inclusive workplace fostering communication and cohesion.

The USPTO has inquired into what cultural and institutional barriers exist within the workplace and how organizations can effectively combat these barriers. While no ethnic or racial statistics are collected by the USPTO it would be irresponsible to assume that the USPTO would be exempt from the effects of institutional discrimination that plagues our society. This comment will break down the barriers that plague the workplace into two categories: entry level barriers and intra-team level barriers, and the potential solutions to those barriers.

Entry level barriers

Minority groups are affected by a variety of institutional barriers that are categorically unfair and damage innovation. These barriers range from generational poverty and lack of access to higher education to employer bias. Not all of these barriers are appropriate for either the USPTO or employers to solve. The main focus of this comment and the barrier most appropriate for employers to solve is their requirement for an advanced degree for any job position.

Advanced degrees represent a divide between the working class and upper middle class in modern society. A study by Georgetown University found that two thirds of job openings will require a higher education. This often arbitrary requirement unfairly limits underprivileged individuals and often relegates them to minimum wage jobs. This is true because less than ten percent of those from the lowest quartile of wealth complete college degrees, while about three-quarters from the top quartile do. Additionally, this degree requirement discriminates against

foreign nationals who despite having years of industry experience may not have an adequate degree for a lateral movement. Employers value a diploma as it represents intelligence, a good work ethic, and responsibility. None of these qualities are unique to a diploma though, as they could just as easily be seen in four years of work experience instead of four years of schooling. There is also the argument that education will better prepare new graduates for a technologically advanced job; however only sixteen percent of college graduates believe their education prepared them for a well-paying job.

A simple change that would break down this barrier is to remove the requirement and instead as a standard part of the interview the employer could simply prepare a short test to ensure that the prospective employee has the requisite knowledge. If the potential employee can demonstrate they have the knowledge, why should the employer care where it was obtained? This is no different than the USPTO's requirement to have a college degree in certain fields, if the candidate can pass the Registration Examination and can understand the technology that they practice in. The USPTO attempts to bridge this gap by allowing for alternative acceptance by a showing of adequate knowledge. This helps, but in itself is not sufficient to remedy the issue. Employers are even more biased as an otherwise qualified person will be looked over and dismissed. The testing process is not unheard of, computer science jobs frequently have a problem-solving section to the interview to prove their abilities.

Intra-team level barriers

In order to identify the barriers that exist within the same team in the workplace I look to the arguments often cited for why diversity hurts innovation despite there being empirical evidence of diversity improving financial performance on measures such as profitable investments at the individual portfolio-company level and overall fund returns. Most of these anti-diversity arguments are centered around the individual level saying that diversity leads to decreased social integration and communication. Social integration and communication are always the most cited reasons for why to not endorse not hiring more of the same. Both of these issues are factual, it is harder to communicate with someone who might have grown up somewhere else and it is more difficult to relate to someone who has a much different life experience than you. However, these are not reasons for why a potential employee might not be the best for the job. Social integration is difficult to solve and one that the workplace is not the best place to fix. As society becomes more and more open minded so too will the workplace.

Communication between coworkers is something that can be bolstered in the workplace. As the world becomes more interconnected the best for the job will more frequently be from foreign countries that are looking to immigrate. Attracting this kind of world class talent should not be inhibited because English is their second language. In order for a company to aid communication the company can support further individual education and both provide financial support or outright provide ESL classes for employees interested. This would further transition a new employee into the company culture and provide further opportunities for team bonding. Unfortunately, only a small number of companies have used this practice and there have not been any yet published studies that definitively show the economic gains from this social benefit.

Conclusion

While an inventor is never really an average person as they made an exceptional discovery, anyone can be an inventor and the workplace should reflect that. Even in workplaces that do not purposefully discriminate, the gap between the 'us' and 'them' will never be bridged if an effort is not made. The best place for a company to catch its own inadvertent discrimination is who they hire for their positions and how the company supports minority groups within their own company. The most prevalent areas of inadvertent discrimination are the lack of acceptance for experience over education and intra team relations.

DESTIGMATIZING QUEERNESS IN STEM AND INVENTION

To:	United States Patent and Trademark Office (“USPTO”)
From:	Ernest Fok ¹ , M.Ed. Mind, Brain, and Education, 3L Law Student at Santa Clara University School of Law
Date:	February 15, 2021
Re:	Comments Regarding the National Strategy for Expanding American Innovation, Docket No.: PTO-P-2020-0057

Question Addressed

III.11 - Inventors thrive when cultural and institutional barriers within workplaces are minimized or removed. What are examples of these barriers, and how can organizations remove them to create an inclusive, innovative workplace culture?

Short Answer

The USPTO can address the socio-professional roadblocks facing queer STEM professionals by (1) working with other federal agencies to consider queer identity as a form of diversity, (2) increasing reliable demographic data on queer participation in inventing, and (3) improving the agency’s own practices to better support the queer STEM professionals. These three steps can lead to cultural changes in STEM innovation such that the default of cis-heteronormativity no longer drives implicit bias towards queer scientists.

This comment will use “queer” as an umbrella term to capture the spectrum of non-normative sexual and gender identities, which includes, but is not limited to, lesbian, gay, bisexual, transgender, intersex and asexual.²

Illusion of Cis-Heteronormativity Among STEM Professionals

About 3.5% of the United States identifies as queer, with approximately eight million queer-identifying people in the nation’s workforce.³ These queer employees still encounter

¹ Ernest “Ernie” Fok is a former higher education professional, future patent litigation associate, and advocate for the Asian Pacific American and LGBT legal communities.

² See GLAAD MEDIA REFERENCE GUIDE – LESBIAN / GAY / BISEXUAL / GLOSSARY OF TERMS, <http://glaad.org/reference/lgbtq> (last visited Feb. 15, 2021) (defining “queer” as an adjective used by some people, whose sexual orientation is not exclusively heterosexual. Some people may also use queer, or more commonly genderqueer, to describe their gender identity and/or gender expression. Once considered a pejorative term, queer has been reclaimed by some LGBT people to describe themselves; however, it is not a universally accepted term even within the LGBT community).

³ Jeremy B. Yoder & Allison Mattheis, *Queer in STEM: Workplace Experiences Reported in a National Survey of LGBTQA Individuals in Science, Technology, Engineering, and Mathematics Careers*, 63 J. HOMOSEXUALITY 1, 2 (2016) [hereinafter, Yoder].

“differential treatment due to their sexual identity” even in ostensibly queer-friendly environments, increasingly progressive policies, and widening social acceptance of queer people.⁴ This is particularly true in science, technology, engineering, and mathematics (STEM) workplaces which serve as important pipelines of scientists who contribute innovations to the United States’ robust patent system.

Within STEM fields, there is a persistent stereotype of scientists as White and male, and a correspondingly rigid expectations of gender and sexuality within STEM workplaces.⁵ These professional settings are “culturally dominated by hegemonically masculine-typed behavioral norms and interactional styles [] that devalue femininity.”⁶ More broadly, there is a “cis-heteronormative assumption”— that gender is binary (only male or female) and that heterosexuality is the only normal sexuality⁷— about scientists which silence conversations about the wide spectrum of sexual and gender identities.⁸ This default assumption is difficult to overcome because STEM careers perpetuate the idea of scientific objectivity, which acts as another social barrier to one’s ability to be openly queer in the workplace and other professional contexts.⁹ However, these ideals “can also, paradoxically, stifle discussion of sexual identity, leading many gender and sexual minorities to feel unwelcome, or at least unsure, in science.”¹⁰ This unfortunate status quo poses a threat to queer scientists who feel invisible at their institution, laboratory, classroom, or office because “[s]exual orientation and sexual and gender identity are not common topics of conversation in many [STEM] workplaces.”¹¹

This threat affects both openly queer scientists and scientists who have not disclosed their queer status. Openly queer scientists face harassment at all career levels and often leave their jobs because of it.¹² For example, a March 2016 report on LGBT Climate in Physics reported that “over one third of LGBT survey respondents considered leaving their workplace or school after experiencing or observing harassment or discrimination.”¹³ Harassment manifests as implicit bias, micro-aggressions, and fear that can impact the behaviors of queer scientists in the workplace.¹⁴ For instance, queer scientists constantly weigh their personal safety versus career opportunities.¹⁵ They have to consider whether it is safe to apply for new positions, attend conferences, or travel for fieldwork because these opportunities may be located in more

⁴ Yoder, *supra* note 2, at 3.

⁵ See Yoder, *supra* note 2, at 4.

⁶ Erin A. Cech & Michelle V. Pham, *Queer in STEM Organizations: Workplace Disadvantages for LGBT Employees in STEM Related Federal Agencies*, 6 J. Soc. Sci. 1 (2017) [hereinafter, Cech].

⁷ Cech, *supra* note 6, at 2.

⁸ *LGBT+ Scientists Give Their Views on Their Workplaces*, 586 NATURE 813 (2020) [hereinafter, LGBT+ Scientists].

⁹ See Yoder, *supra* note 2, at 21-22.

¹⁰ Barbara Moran, *Is Science to Straight? LGBTQ+ issues in Stem Diversity*, Boston University, <https://www.bu.edu/articles/2017/lgbt-issues-stem-diversity/> (last visited Feb. 15, 2021) [hereinafter, Moran].

¹¹ LGBT+ Scientists, *supra* note 7, at 813.

¹² See generally Yoder, *supra* note 2.

¹³ Moran, *supra* note 10.

¹⁴ Yoder, *supra* note 2, at 4.

¹⁵ Liza Brusman, *Science thinks it's unbiased. Queer scientists know that's not true*, Massive Science (June 18, 2020), <https://massivesci.com/articles/queer-science-stem-lgbtqia-bias-field-work-lab-universities-school-discrimination/> [hereinafter, Brusman].

conservative places.¹⁶ In a study of American and Canadian medical students, some respondents who identified as queer “refrained from disclosing their identity because of concerns of their future career options, specialty choice, and geographic practice flexibility” citing that their gender and sexuality “would drive patients and colleagues away.”¹⁷ Similarly, scientists who conceal their queerness face a challenge whether they have a perceived or actual need to conceal one’s identity. For instance, the perceived or actual need to conceal one’s identity can contribute to stress and negative mental health and can strain social relationships. Because of these factors, concealment is expected to reduce workplace productivity, even in the absence of active discrimination.¹⁸ The result is a marginalized and underrepresented queer scientist community, which invariably reduces inventorship diversity in the United States.

How Does this Reduce Inventorship Diversity in the United States?

STEM scientists are in a strong position to recruit, mentor, and train the next generation of innovators, especially those that serve as faculty members at research universities and institutions. While STEM faculty reported “significantly higher levels of professional outness,” which indicates how open an individual is at work with regard to their sexual orientation, these openly queer faculty also indicated a high likelihood of leaving their institutions.¹⁹ When faculty members leave an institution, the pipeline of STEM professionals and future STEM mentors is disrupted because institutions lose valuable opportunities to recruit or retain students, staff, and faculty colleagues with similar demographics.²⁰ This not only hinders the development of STEM talent, which already suffers from a leaky pipeline, but also leads to an increasingly heteronormative climate for the queer science community.²¹ The loss of current and future queer faculty mentors is particularly problematic because there are so few resources that support queer STEM students.²² Like queer faculty and staff, queer students are significantly more likely than their cisgender and heteronormative peers to have negative perceptions of their campus climate, and as a result, they are more likely to consider leaving their institution.”²³ If there are fewer queer scientists, diversity decreases and innovation suffers.²⁴

Without proper support, there will likely be a dwindling number of queer scientists resulting in a smaller, less diverse group of innovators.

¹⁶ Brusman, *supra* note 14.

¹⁷ Matthew Manesh et al., *Sexual and Gender Minority Identity Disclosure During Undergraduate Medical Education: “In the Closet” in Medical School*, 90 *Academic Medicine* 5, 9 (2015).

¹⁸ Yoder, *supra* note 2, at 21-22.

¹⁹ Eric V. Patridge, *Factors Impacting the Academic Climate for LGBTQ STEM Faculty*, 20(1) *J. WOMEN AND MINORITIES IN SCI. AND ENG’G* 75, at 91 [hereinafter, Patridge].

²⁰ Patridge, *supra* note 18, at 94.

²¹ Patridge, *supra* note 18, at 94.

²² Patridge, *supra* note 18, at 94.

²³ Patridge, *supra* note 18, at 76.

²⁴ See Scientific American, *How Diversity Makes Us Smarter*, <https://www.scientificamerican.com/article/how-diversity-makes-us-smarter/> (Oct. 1, 2014) (“Diversity enhances creativity. It encourages the search for novel information and perspectives, leading to better decision making and problem solving. Diversity can improve the bottom line of companies and lead to unfettered discoveries and breakthrough innovations. Even simply being exposed to diversity can change the way you think.”)

How Can the USPTO Address the Issues Facing Queer Scientists?

The USPTO can address the socio-professional roadblocks facing queer STEM scientists by (1) working with other federal agencies to consider queer identity a form of diversity, (2) increasing reliable demographic data on queer participation in inventing, and (3) improve its own existing practices to better support queer STEM professionals. These three steps can lead to cultural changes in STEM innovation such that the default of cis-heteronormativity no longer drives implicit bias towards queer scientists.

First, the USPTO needs to work with key agencies that fund STEM research and the resulting patents that arise from this investment. For instance, federal funding agencies like the National Institutes of Health (NIH) and National Science Foundation (NSF) do not consider queer identity a form of diversity like race, ethnicity, and gender.²⁵ These institutions track STEM participation and are widely used by funding agencies and universities, and the continual exclusion of queer demographics has left out “one of the largest, but least studied, minority groups in the workforce” and has led to a potential loss of “approximately 54,000 to 121,000 LGBTQ people who would currently otherwise be in STEM.”²⁶ The NIH and NSF provide a substantial amount of support for individual STEM pre-doctoral and post-doctoral candidates, and recognizing queer status can incentivize universities to attract, retain, and nurture queer talent. This would strengthen the pipeline of queer STEM scientists at critical moments in their training, and has potential to shape existing behavior of principal investigators to create a more open, queer-friendly environment. This would not only benefit research labs seeking sustained funding in competitive publish-or-perish environment, but also drive change at an individual, group, and system-wide level.

Second, the USPTO should also recognize queer participation in its patent examination processes. By increasing reliable demographic data about queer participation in patenting, the USPTO can encourage publications by the queer communities in the STEM fields. This is important because most recent, data-driven research of queer communities has been restricted to the social sciences, humanities, and health fields. Moreover, of the few publications focused on queer communities in the STEM fields, none are based on empirical data.²⁷ By creating a process for inventors and assignees to identify their queer status— but in a way that does not materially affect the patent examination process— the USPTO can support researchers studying queer communities in the STEM fields. With more empirical data in hand, researchers can provide recommendations to the STEM industries on how they can better support and retain queer scientists. If this approach is successful, the USPTO can serve as an example for other federal agencies to follow suit.

²⁵ NAT'L INST. OF HEALTH, NOTICE OF NIH'S INTEREST IN DIVERSITY, NOT-OD-20-031 (Nov. 22, 2019).

²⁶ Jonathan B. Freeman et al., RE: National Science Foundation (NSF); Notice of Intent to Seek Approval to Extend an Information Collection for Three Years; 2021 National Survey of College Graduates, Federal Register Doc. 2020-09000 (June 29, 2020).

²⁷ Patridge, *supra* note 18, at 78.

Lastly, the USPTO should strongly advocate for queer scientists within the agency, thus contributing to a more supportive academic climate that encourages queer scientists to invent, rather than worry about whether their queer status will materially affect their physical wellbeing, mental health, and career opportunities. Federal agencies are “generally recognized as employing organizations with better average diversity outcomes and greater equality in leadership and remuneration than organizations in the non-academic private sector.”²⁸ However, the USPTO likely sees the same queer workplace experience inequalities that are “quite widespread within STEM-related agencies.”²⁹ In a study of queer employees at the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), the Environmental Protection Agency (EPA), the Department of Energy (DOE), the Nuclear Regulatory Commission (NRC), and the Department of Transportation (DOT), researchers found “significant differences by LGBT status” on workplace experience inequalities such as a “lower likelihood of reporting that their success is fostered,” a perceived “lack of support for diversity,” and “lower job satisfaction.” To address this, the USPTO must focus on the “academic climate” because “simply encouraging” queer STEM professionals to openly identify will not improve their retention or satisfaction.³⁰

Like U.S. higher education institutions, the USPTO needs to reduce exclusionary behavior among its constituents (inventors, assignees, patent agents, attorneys, etc.), resist solutions that delegate responsibilities to minority groups (such as relying on underrepresented minority supervisors to mentor examiners of other minority groups or to advance institutional issues), and avoid tokenism.³¹ The USPTO could be doing more to support its queer community. For instance, the USPTO allows its employees to create an affinity group, but no group exists for the queer community, thus placing the burden of supporting the queer community on its queer employees.³² The USPTO can have more impact by taking more proactive measures to show support for its queer constituents. The USPTO can draw upon two college campus studies where queer employees were “less likely to report experiences with or observations of heterosexism or cissexism within institutions that had *written nondiscrimination policies*” that included ‘sexual identity’ and ‘gender identity and expression’ in their diversity statements, and offered same-sex partner benefits.”³³ Moreover, these employees “were also more likely to disclose their sexual identity if they had LGBT co-workers and worked in organizations that had non-discrimination policies in place.”³⁴ These findings suggest that the USPTO can create a more queer inclusive

²⁸ Cech, *supra* note 6, at 2 (studying workplace experience inequalities by queer status in STEM-related federal agencies).

²⁹ Cech, *supra* note 6, at 2.

³⁰ Patridge, *supra* note 18, at 91.

³¹ See Patridge, *supra* note 18, at 92.

³² See USPTO, *Community Groups*, <https://www.uspto.gov/initiatives/expanding-innovation/community-groups> (last visited Feb. 15, 2021).

³³ Warren J. Blumenfeld et al., , In Our Own Voice: Campus Climate as a Mediating Factor in the Persistence of LGBT People in Higher Education, 17 (2016) [henceforth, Blumenfeld]

³⁴ Blumenfeld, *supra* note 32, at 17.

environment by such as revising its non-discrimination statements and other policies to be inclusive of sexual orientation, gender identity, and gender expression.³⁵

To summarize, the USPTO can help overcome cis-heteronormativity in STEM and drive queer involvement in innovation by (1) working with other federal agencies to consider queer identity as a form of diversity, (2) increasing reliable demographic data on queer participation in inventing, and (3) improving the agency's own practices to better support the queer STEM professionals. These suggestions will not suddenly increase the number of queer scientist-inventors. However, these steps acknowledge the plight facing queer STEM scientists, and that supporting this underrepresented group requires gradual change at the locations for innovation (universities, STEM workplaces, etc.).

³⁵ See Patridge, *supra* note 18, at 92-93.

HELPING INDIVIDUAL INVENTORS AND SMALL BUSINESS THROUGH AN UPDATED USPTO WEBSITE AND INFORMAL EVENTS

To:	United States Patent and Trademark Office (“USPTO”)
From:	Matthew Hodgson, USPTO Reg. No. 76,910, 2L Law Student at Santa Clara University School of Law, Tyler Cox, USPTO Reg. No. 76,130, 2L Law Student at Santa Clara University School of Law,
Date:	February 4, 2021
Re:	Comments Regarding the National Strategy for Expanding American Innovation, Docket No.: PTO-P-2020-0057

Question Addressed

II.12 - Access to information and resources is pivotal for the development of individual inventors and small businesses. How can the nation better support individual inventors and small businesses with resources so they can successfully translate their skills and creativity into the acts of invention, intellectual property protection, and entrepreneurship?

Short Answer

The USPTO website and online patent tools should be updated by (1) Making existing or new error detection tools available to discounted or all applicants; (2) Translating USPTO website information to other languages to allow for wider access; (3) Updating information and trainings on prior art searching; and (4) Providing additional resources that can help with the patent process. Further, more in-person informational events for individual inventors and small businesses should be hosted.

The United States Patent and Trademark Office (USPTO) has asked for help with developing a national strategy to build a more demographically, geographically, and economically inclusive innovative ecosystem.

Below, we draw from our personal experiences in making our comments, using the singular “I” to refer to one of our experiences.

Individual inventors and small businesses are underrepresented and disadvantaged in our patent system. From 1977 to 2015 roughly 14% of granted patents were issued to individual inventors.¹ Further the transition to the America Invents Act “may have a darker side for

¹ See USPTO, Patent Technology Monitoring Team, PATENT COUNTS BY CLASS BY YEAR - INDEPENDENT INVENTORS JANUARY 1977 -- DECEMBER 2015, *See also* USPTO, Patent Technology Monitoring Team, PATENT COUNTS BY COUNTRY, STATE, AND YEAR - ALL PATENT TYPES (DECEMBER 2015).

individual inventors.”² Individual inventors are likely slower than large corporations in turning inventions to patent applications.³ Large corporations often have access to resources, such as funding, patent attorneys, and experienced staff, which substantially cuts down on patent filing turnaround.⁴ Alternatively, individual inventors are likely resource constrained, placing them at a disadvantage in the filing race.⁵

Our comments explain how the USPTO can better support individual inventors and small businesses by improving access to information regarding the process of obtaining patent protection as well as by providing better resources to help these small entities secure patent protection for their novel technologies. To help individual inventors and small businesses with the patent process, this paper recommends (I) updating the USPTO website and online patent tools; and (II) hosting more in-person informational events for individual inventors and small businesses. This will inevitably “promote the progress of science and useful arts.”⁶

I. Updating the USPTO website and online patent tools.

As a second-year law student, I am surprised at the number of times I have been asked by individual inventors and small businesses for patent advice. Most of the questions I receive are relatively simple and these small entities could answer them on their own if they had access to more resources and information. For example, an undergraduate colleague reached out to me asking how to conduct a prior art search. I pointed him to the USPTO website, but he was unable to figure out how to conduct a search.

Overall, the USPTO does an adequate job providing information for small entities, but there is room for improvement. The following four recommendations are proposed to the USPTO: (1) Make existing or new error detection tools available to discounted or all applicants⁷; (2) Translate USPTO website information to other languages to allow for wider access; (3) Update information and trainings on prior art searching; and (4) Provide additional resources that can help with the patent process. These recommendations would allow individual inventors and small businesses to better translate their skills and creativity into the acts of invention, intellectual property protection, and entrepreneurship.

1. Make existing or new error detection tools available to discounted or all applicants.

As Professor Colleen Chien has noted, small entities drop out at a heightened rate at every phase of patenting.⁸ For example, in 2000 small entities composed 33% of patent applications

² David S. Abrams & R. Polk Wagner, *Poisoning the Next Apple? The America Invents Act and Individual Inventors*, Harv. L. Rev. Vol. 65, No. 3 517, 520 (Mar. 2013).

³ *Id.*

⁴ *Id.*

⁵ *Id.*

⁶ U.S. Con. Art. I, Sec. I, Cl. 8.

⁷ Colleen V. Chien, *Rigorous Policy Pilots the USPTO Could Try*, 104 IOWA L. REV. BULL. 1, 19 (2019-2020).

⁸ *Id.*

filed, but only 25%, 23%, 18%, and 15% at the milestones of first, second, and third maintenance fees, respectively.⁹ Encouraging small entities to file with lower fees, will just lead to higher rates of dropping out before the patent issues.¹⁰

As Chien has noted, one factor leading to these high rates of drop out is 35 U.S.C. § 112, which requires adequate disclosure of inventions.¹¹ Individual inventors often have difficulty providing clear claim language, clear numbering, and correspondence between the claims and the specification, the figures, and the text, often leading to § 112 rejections.¹² Commercial products, such as TurboPatent's "RoboReview", uses artificial intelligence to identify potential § 112 issues.¹³ However, individual inventors are likely under-resourced and least likely to have access to fee-based tools.¹⁴

We endorse the recommendation made by Chien that the USPTO make available or create error detection tools and provide these to discounted or all applicants.¹⁵ Further, the USPTO should at least test if these error detection tools significantly decrease § 112 rejections of individual inventors.¹⁶ For example, the USPTO could provide error detection software at random to a sample of discounted applicants and measure the impact of the technology on the quality of applications.¹⁷

2. Translate USPTO website information to other languages to allow for wider access.

The USPTO does not provide translations for most of its online materials. One of us is a monolingual English speaker who has spent significant time overseas in Taiwan. Not understanding Mandarin was a huge obstacle and severely impeded his speed in reading foreign literature. Although translation software works well, there was often information lost in

⁹ *Id.*

¹⁰ *Id.* at 20.

¹¹ *Id.* at 20; See 35 U.S.C. § 112 (2012) ("The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.").

¹² Chien, *supra* note 7 at 20-21.

¹³ *Id.* at 23.

¹⁴ *Id.*

¹⁵ See *Id.*

¹⁶ See *Id.* at 24.

¹⁷ See *Id.*

translation. Non-native English-speaking individual inventors and small businesses are seriously disadvantaged by their lack of access to the posted USPTO information on patents.

The United States Census Bureau conducted an extensive survey on 291,484,482 Americans.¹⁸ They found that 20.7% of people surveyed spoke a language other than English at home.¹⁹ Further, they found that 8.6% of people surveyed spoke English “less than very well.”²⁰

Lack of translation limits access to posted USPTO information on patents by a significant number. Roughly one in ten people have severe difficulty reading through the material, while one in five people have some difficulty. Providing translations, especially on the patent process, would be extremely beneficial to individual inventors and small businesses.

3. Update information and trainings on prior art searching.

The USPTO does an adequate job at providing information on prior art searching, but there is room for improvement. Individual inventors and small businesses greatly benefit from conducting an initial prior art search. They can formulate opinions on patentability and further understand how to differentiate their features. As stated, I have been approached by a surprising number of individual investors who are unable to conduct prior art searches, even after I point them to the USPTO website. Individual inventors and small businesses need updated information on the USPTO website regarding prior art searching.

First, the USPTO website is difficult to navigate, specifically regarding the patent process overview section. The page is filled with hyperlinks and is laid out in a hard-to-follow format.²¹ For example, the titles of the eight steps are not indicative of the material in each section.²²

Second, the USPTO website dissuades individual inventors from performing prior art searches. For example, the website first states, “[i]f you are not experienced at performing patent searches, a registered attorney or agent is recommended.”²³ Later, it states, “[i]t is possible, though difficult, for you to conduct your own search.”²⁴ The language and formatting should be changed to first encourage individual inventors and small businesses to perform a prior art search, while second informing them that professionals are available for additional support.

Third, the Seven Step Strategy is useful, but it is not succeeding in its mission to help educate inventors. It is great that the USPTO includes a feedback system, however it is not being considered. For example, the feedback system currently says 1111 users found the Seven Step

¹⁸ United States Census Bureau, Detailed Languages Spoken at Home and Ability to Speak English for the Population 5 Years and Over: 2009-2013 (2015).

¹⁹ *Id.*

²⁰ *Id.*

²¹ See USPTO, Patent process overview, <https://www.uspto.gov/patents/basics/patent-process-overview#step1>.

²² *Id.*

²³ *Id.*

²⁴ *Id.*

Strategy “helpful,” while 466 users found it “not helpful.”²⁵ Almost one-third of people accessing the site do not find it useful. It is apparent that the site needs updating, both in substance and presentation.

Finally, the website information should be supplemented with auditory and visual materials, as there is a clear benefit to multisensory learning.²⁶ Currently there is a section titled “How to Conduct a Preliminary U.S. Patent Search: A Step by Step Strategy - Web Based Tutorial (36 minutes).”²⁷ However, when this is selected a 404 error is provided.²⁸ The USPTO should update this material or provide additional auditory and visual materials to supplement individual inventors and small business prior art searching development.

Overall, the USPTO website has a good start at providing information on prior art searching. However, it can be improved by simplifying the layout, encouraging prior art searches by individual inventors and small businesses, making the information more useful through updated substance and presentation, and adding auditory and visual materials.

4. Provide additional resources that can help with the patent process.

The USPTO does an adequate job at providing additional resources that can help with the patent process. For example, it provides information on active registered practitioners, the Patent Pro Bono Program, and the Law School Clinic Certification Program.²⁹ However, other resources are available and the USPTO including them on their website would have dramatic benefits for individual inventors and small businesses.

I was an Associate in Santa Clara’s Entrepreneurs’ Law Clinic, where legal services are provided to individuals. I completed work such as provisional patent applications, memos explaining IP rights, and trademark searches. My clients expressed great gratitude for the work, as some would be unable to afford the work products through conventional methods. Client testimony is as follows:

*We feel very lucky to have worked with the ELC over many semesters and we’ve found that because of the ELC we’re better equipped to handle an array of challenges that new ventures have to contend with. The students and their advisors at the ELC have done top-quality work and given us valuable tools that we’ve used in our early-stage business.*³⁰

²⁵ See USPTO, Seven Step Strategy, <https://www.uspto.gov/learning-and-resources/support-centers/patent-and-trademark-resource-centers-ptrc/resources/seven> (Feb. 3, 2021).

²⁶ Ladan Shams, *Benefits of multisensory learning*, Trends in Cognitive Sciences, Vol. 12, Issue. 11 (Nov. 2008).

²⁷ See USPTO, Patent process overview, note 9.

²⁸ See USPTO, 404 Error, <https://www.uspto.gov/web/offices/ac/ido/ptdl/CBT> (Feb. 3, 2021).

²⁹ See USPTO, Free Legal Services for Inventors, <https://www.uspto.gov/learning-and-resources/newsletter/inventors-eye/free-legal-services-inventors>.

³⁰ Santa Clara Law, Entrepreneurs’ Law Clinic – Client Testimonials, <https://law.scu.edu/elc/elc-client-testimonials/>.

Most of our clients heard about us through word of mouth and the USPTO could expand outreach by including these and similar services on their website. There are currently 120 other Entrepreneurs' Law Clinics throughout the United States offering similar legal services.³¹ The USPTO creating awareness of these and similar programs would greatly benefit individual inventors and small businesses, as they could be provided with a quality legal service at low or no cost.

II. Hosting more in-person informational events for individual inventors and small businesses

While online resources can be useful tools for helping individual inventors and small businesses pursue patent protection, they are not the only resources available to inventors. The USPTO also hosts informational events around the country. From 2015 to 2019, the USPTO hosted over 2000 such events.³² These events cover a wide range of topics. Some of these events are intended for sophisticated patent practitioners. For example, on February 26, 2019, the USPTO hosted an information session for Patent practitioners regarding the 2019 Revised Patent Subject Matter Eligibility Guidance.³³ This event, and others like it, allow the USPTO to provide guidance to patent attorneys so that the attorneys can provide better service to their clients.

The USPTO also hosts events intended to help individual inventors, small businesses, entrepreneurs, and others that are generally unfamiliar with the intellectual property law become more familiar with and comfortable with the patent process. For example, on April 22, 2015, the USPTO hosted "Patent Basics for Inventors, Entrepreneurs, and Startups" in New York.³⁴ At this event, a representative from the USPTO and a patent attorney from a prominent law firm discussed "including the types of patents, the parts of a patent application, the examination process, claims analysis with respect to novelty and obviousness, and the office action" as well as "insight into the role of the patent attorney."³⁵ Similarly, in 2018, the Rocky Mountain U.S. Patent and Trademark Office in Denver hosted a four-part "IP for Beginners" series.³⁶ These discussions were intended to introduce attendees to various aspects of intellectual property, such as novelty, patent searching, and effectively using the USPTO's online tools to file and prosecute a patent application.³⁷

³¹ See New Media Rights, Law school IP and entrepreneurship clinics list, https://www.newmediarights.org/law_school_ip_and_entrepreneurship_clinics_list#CA.

³² See USPTO, Events, <https://www.uspto.gov/about-us/events>.

³³ See USPTO, Patent practitioners: Attend a session on the 2019 Revised Patent Subject Matter Eligibility Guidance, <https://www.uspto.gov/about-us/uspto-locations/silicon-valley-ca/patent-practitioners-attend-session-2019-revised-subject>.

³⁴ See USPTO, Patent Basics for Inventors, Entrepreneurs, and Startups, <https://www.uspto.gov/about-us/uspto-locations/cornell-university-ny/patent-basics-inventors-entrepreneurs-and-startups>.

³⁵ *Id.*

³⁶ See USPTO, Events.

³⁷ See USPTO, Part I: IP for Beginners Series - Overview of Utility Patents, Design Patents, Trade Secrets, Copyrights, and Trademarks, <https://www.uspto.gov/about-us/events/part-i-ip-beginners-series-overview-utility-patents-design-patents-trade-secrets-0>; Part II: IP for Beginners- Design Patents, <https://www.uspto.gov/about-us/events/part-ii-ip-beginners-series-design-patents-0>; Part III: IP for Beginners Series - Tips and Tricks for Patent Searching: "The 7-Step Search Process" <https://www.uspto.gov/about-us/events/part-iii-ip-beginners-series-tips-and-tricks-patent-searching-7-step-search-proces-0>; Part IV: IP for Beginners Series - How to File: Patent Electronic

The USPTO hosts events in almost every state, with only Alaska, Connecticut, New Hampshire, and Rhode Island not having an event of any kind from 2015 to 2019.³⁸ However, some states host a disproportionate number of events. For example, from 2015 to 2019, the USPTO hosted over 380 events in California, which is approximately 21% of all USPTO events. In contrast, the USPTO only hosted 17 events in Florida during this same period, which is less than 1% of all USPTO events. Even taking differences in population into account, California still hosts more than 12 times as many events per person as Florida.³⁹ Additionally, over 60% of the USPTO's events were hosted at one of its five regional offices in Alexandria, Dallas, Denver, Detroit, and San Jose.⁴⁰ While these offices are spread around the country, they are still not readily accessible for many people and may require several hours of driving to attend events. Even for inventors living in major metropolitan areas, such as Phoenix or Atlanta, attending an in-person event at one of the regional offices is impractical and inconvenient.

To ensure that attending an information event for individual inventors and small businesses is possible, the USPTO should host significantly more in-person information sessions and workshops around the country. Hosting more of these events in more locations would allow more inventors to attend these events and would likely increase the number of independent inventors and small businesses pursuing patent protection. The USPTO could also partner with local bar associations so that local patent attorneys can attend and provide another source of information to the attendees. Partnering with local Chambers of Commerce and engineering societies could also be helpful in advertising these events to local members and improve turnout at the events.

We appreciate your attention to this matter. If you have any questions, please do not hesitate to contact us.

Sincerely,

Matthew Hodgson, USPTO Reg. No. 76,910

Tyler Cox, USPTO Reg. No. 76,130

Application Filing and Management Systems <https://www.uspto.gov/about-us/events/part-iv-ip-beginners-series-how-file-patent-electronic-application-filing-and-0>.

³⁸ See USPTO, Events.

³⁹ See United States Census Bureau, State Population Totals and Components of Change: 2010-2019, <https://www.census.gov/data/tables/time-series/demo/popest/2010s-state-total.html>.

⁴⁰ See USPTO, Events.

SUGGESTIONS FOR INCREASING DIVERSITY IN IP LAWYERS AND AGENTS

To:	United States Patent and Trademark Office (“USPTO”)
From:	Jae Yeon (Claire) Baek, 2L Law Student at Santa Clara University School of Law, (“Author A”) Zachary Nemirovsky, 2L Law Student at Santa Clara University School of Law, (“Author B”)
Date:	February 4, 2021
Re:	Comments Regarding the National Strategy for Expanding American Innovation, Docket No.: PTO-P-2020-0057

Question Addressed

III.13 - Another important objective is increasing diversity in the entire intellectual property field. What are ways of promoting diversity in the corps of intellectual property attorneys and agents who represent innovators?

Short Answer

The question is difficult, because part of the problem is the absence of minorities from STEM education in general, for which the USPTO is not the best tool. Rather, the USPTO should create and run outreach programs so that minorities in STEM are aware of the possibility of a career in patent law (many are not), and should also use their leverage with law firms to promote diversity and create support for minority patent attorneys and agents.

The USPTO has asked, as Question 13 in its request for comments, for “[w]ays of promoting diversity in the corps of intellectual property attorneys and agents who represent innovators?” We endeavor to provide some ideas to answer that question.

1. General Background

Diversity remains one of the most difficult problems to solve in the practice of law. Research has found that men outnumber women in equity partner positions nearly five to one. Approximately only 9 percent of equity partners are racially diverse minorities. Of the 9 percent, only one-third are racially diverse women.¹

Unfortunately, the statistics are worse for IP attorneys, for example, patent attorneys. For example, in 2017, the highest percentage of women were registered with the USPTO than any other year. However, in that year, only 33.9 percent of all registrations were female. Given that

¹ https://www.americanbar.org/groups/intellectual_property_law/publications/landslide/2020-21/september-october/diversity-patent-law-data-analysis-diversity-patent-practice-technology-background-region/

women account for more than 50 percent of law school entering classes, this may indicate a significant difference in gender representation in patent law. Even worse, the average USPTO registration for racial minorities since 2000 has hovered around 6.5 percent.

This is, in part, because the patent bar requires a hard science background, such as a degree in engineering, chemistry, physics, or biology. The science, technology, engineering, and mathematics (STEM) field has unquestionably been dominated by men, particularly in the areas of computer science, electrical engineering, and mechanical engineering. Thus, increasing representation of diverse practitioners is an even more difficult problem for patent law partially because of the requirements in degrees to sit for the patent bar.

As a personal example, Author A has been practicing as a patent agent at a large law firm (> 400 attorneys) in Silicon Valley for the past 6 years. In the group of patent practitioners at the firm, only 1 woman is an equity partner out of a total of 9-10 patent partners. Since diverse leadership is necessary to inspire the next generation of diverse patent practitioners, there is a significant need to increase diversity in the intellectual property field, or this problem will go unsolved. Increasing diversity in patent law can also lead to more diverse innovators and thus, more diverse inventions. Moreover, diverse role models in patent law and in the field of law in general can inspire many more diverse candidates in the generations that follow.

3. A Problem - The STEM to IP Pipeline

Becoming a patent agent or attorney requires sitting for the patent bar, which for good reason requires some sort of scientific or technical training. However, most of the time this is satisfied through a short list of specific STEM degrees.² This creates a two-pronged pipeline feeding into the diversity issues of the patent bar.

Firstly, and obviously, it is only STEM credentialed applicants who can apply for the patent bar. According to the National Science Foundation (NSF), the STEM workforce is 89% white and 72% male, while the overall workforce is 78% white and 53% male. Right now in the U.S., there are currently more non-white children than white children, and nearly half of all children born are female. Unfortunately, STEM fields do not currently reflect the diversity of our country.³ This disparity is even more pronounced in engineering fields such as electrical engineering or mechanical engineering. As a personal example, Author A attended a graduate program in electrical engineering at U.C. Berkeley, which only had roughly 10-15% women in the program.

² Although an applicant can qualify by a detailed showing of courses taken and unit-hours earned, or by taking the Fundamentals of Engineering exam, these avenues require significantly more work and are not “automatic” like Category A. Thus, they may have a deterrent effect on applicants. For example, Author B holds a B.S. in Applied Physics from the University of California, Davis. In order to qualify, he must dig through University catalogs and old transcripts to document the course descriptions of their courses. Although Author B has a strong desire to take the Patent Bar, he has not done so yet, and, had he been an applicant “on the fence,” might have been deterred from taking it altogether.

³ <https://caseagrant.ucsd.edu/blogs/diversity-in-stem-what-is-it-why-does-it-matter-and-how-do-we-increase-it>

This has an unfortunate effect on the diversity of patent attorneys and agents. For example, since only 36% of STEM degrees are awarded to women,⁴ the USPTO could reasonably expect, assuming no attrition, for only 36% of its patent practitioners to be women. Thus, to increase diverse representation in IP law, it is critical that representation in STEM fields as the first prong of the pipeline is improved. Various solutions to this prong of the pipeline have already been proposed.

A. Solutions to the First Side of the Pipeline:

One way to improve STEM diversity is to promote programs that reach out to diverse children from an early age that promote exposure to STEM fields. Research has shown that perceptions about a group develop from a young age, and thus, there is a need to increase exposure to these fields to diverse STEM candidates early on, so that these children have a natural perception that people like them can also be a member of STEM societies. As a personal experience, a majority of the most successful female and racial minority colleagues that Author A has talked to have recalled their experiences of growing up with toys, camps, and other programs that are related to STEM and that encouraged them to pursue these fields.

Another proposed solution has been loosening the degree requirements of Category A.⁵ However, while some loosening of degree requirements could be beneficial (for example, allowing degrees nearly identical to those listed), any serious reform should be undertaken with care.⁶ For this reason, the first solution – increasing minorities in STEM education – is preferred.

However, the unfortunate reality is that the fact that STEM fields themselves under-represent minorities may not be a problem for the patent bar – but for our education system. To the extent that it can, as discussed above, the USPTO should promote STEM programs for children. But ultimately, the USPTO is a hammer, while the issue of STEM education is a screw. “[I]t is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail.”⁷

B. Solutions at the Second Side of the Pipeline

The second prong of the pipeline is often less talked about, but, unlike the first side, the USPTO is undoubtedly the *right* tool to address it. The issue is that “[o]ftentimes, women and minority engineers do not consider a career in law because they do not know that one exists. In

⁴ https://nces.ed.gov/programs/raceindicators/indicator_reg.asp.

⁵ <https://www.ipwatchdog.com/wp-content/uploads/2020/12/2020.12.11-Letter-to-PTO-re-Patent-Bar-Gender-Gap.pdf>

⁶ See, e.g., (<https://www.ipwatchdog.com/2020/12/14/lowering-bar-diversify-patent-bar-misguided-unethical/id=128263/>) arguing in response to the Dec. 11, 2020 Senate letter that patent practitioners must also *competently* represent their clients, and that a STEM foundation is key to such competence.

⁷ Maslow, Abraham H., *The Psychology of Science*, p. 15 (1966).

fact, many engineers are unaware that a degree in engineering or a hard science provides them with the opportunity to sit for the patent bar exam.”⁸

In other words, even of those women who do receive STEM degrees, few decide to practice law because the USPTO outreach women and minorities in STEM is poor. This likely contributes to the abysmal “carry-through” rate, wherein only about 18% of patent agents and attorneys are women.⁹ Indeed, Author B did not learn of the possibility of practicing law until they were already dissatisfied with a career in science itself, and learned of the possibility for a patent law career from a family friend who was a patent attorney. Such anecdotes support the importance of creating outreach for STEM students, especially diverse students, and especially where those students do not have parents or others close by with backgrounds in IP law. The USPTO should step in to better fill this role of information dissemination.

So while the first prong of the STEM to IP pipeline (i.e., that there are fewer minorities in STEM), which is truly an issue for the Department of Education and not the USPTO, the second prong (i.e., that even when a minority engineer exists, they are unaware of the opportunity to practice law) can be fixed by the USPTO. The USPTO incentivizes law schools to advertise more aggressively to students with STEM backgrounds, or even design outreach initiatives to visit University campuses directly.

3. Another Solution - Promote More Diverse-Friendly Inclusion Policies at Law Firms

Another important aspect for creating diversity is to create more diverse-friendly inclusion policies at law firms and companies that attorneys practice at to encourage more diverse candidates to go and be retained at these organizations.

Law firms are the main source of training and feeder of patent agents and patent attorneys. While some patent attorneys practice as an in-house counsel at a corporation, for example, managing the corporation’s IP portfolio, many of these attorneys start practicing as an associate at a law firm. Thus, to retain diverse IP professionals in the field, it is critical that law firms provide a diverse-friendly environment in which these professionals feel included in the organization. While many companies have started putting in significant efforts on discussing and addressing diversity, law firms may have yet to reach similar standards and policies.

For example, speaking from what we have observed from personal experience, one main reason for the discrepancy between gender representations in leadership is that the policies at law firms do not favor retainment of women simply because they do not fully consider childbirth and the extra legwork that early mothers have that is usually not compatible with the conventional law firm lifestyle. For example, many law firms focus compensation and promotions based on the number of billable hours that the associate bills over the years. Many female attorneys end up leaving firms because it is difficult to balance child caring with the high billable

⁸ https://www.americanbar.org/groups/intellectual_property_law/publications/landslide/2020-21/september-october/diversity-patent-law-data-analysis-diversity-patent-practice-technology-background-region/

⁹ Saurabh Vishnubhakat, *Gender Diversity in the Patent Bar*, 14J.MARSHALL REV.INTEL.PROP.L. 67, 80 (2014).

hour requirements at law firms, and positions with better flexibility can be found in-house. This problem extrapolates to other minorities and how these minorities can also feel more included at law firms.

Thus, if law firms really care about promoting diversity, they should systematically address the current system on how leadership is elected, how associates are evaluated, etc. so that flexibility is valued more over quantitatively how much money an associate brings in to the firm.

SECURING FINANCIAL SUPPORT FOR AN EXPANDED DIVERSE GROUP OF INVENTORS AND ENTREPRENEURS

To:	United States Patent and Trademark Office (“USPTO”)
From:	Dr. Li Guo, Ph.D. Electrical Engineering, 2L Law Student at Santa Clara University School of Law
Date:	February 4, 2021
Re:	Comments Regarding the National Strategy for Expanding American Innovation, Docket No.: PTO-P-2020-0057

Question Addressed

IV.14 - Financial support is a critical element in translating an innovation into commercial success. What organizations, programs, or other efforts help promote access to capital to an expanded group of inventors and entrepreneurs—demographically, geographically, and economically?

Short Answer

To help gain access to more financial support for an expanded group of inventors and entrepreneurs, the PTO should provide more complete and accurate patent records, and create specific counseling panels to support investors for their decision making. The PTO could also consider lowering certain costs for under-resourced minority applicants, including reducing their application fees and other maintenance fees. The PTO may also consider expanding the scope of the patent pro bono program to cover those under-resourced minority applicants.

I hereby provide my comment in response to the PTO’s “Request for Comments on the National Strategy for Expanding American Innovation,” in particular, my comments address Question No.14, i.e. “what organizations, programs, or other efforts help promote access to capital to an expanded group of inventors and entrepreneurs—demographically, geographically, and economically.”

A 2016 survey result¹ shows that innovators found the lack of funding for further development to be the largest and most prevalent barrier they face.² In the survey, lack of funding is cited as an issue for over half of innovations for which barriers to commercialization

¹ Adams Nager et al, The Demographics of Innovation in the United States, 2016 <https://itif.org/publications/2016/02/24/demographics-innovation-united-states>

² *Id* at 58.

were reported.³ Lack of funding for innovation, and the gap within the distribution funding are among the biggest challenges the minority inventors are facing today.

Venture Capital

Venture capital funding plays an important role in commercialization of innovation, and it also affects the diversity of innovation. While more VC funding is expected to help close the diversity gap and expand the inventor group, a closer look into various reports shows that there is a gap within the distribution of VC funding as well. For example, female founders have long been receiving less VC funding than their male counterparts. In 2016 alone, companies with all-male founders received \$58.3 billion VC funding, while women received just \$1.46 billion, which was about 2.5% of the overall funding.⁴ Besides the gender gap, there is also a known ethnic gap when it comes to VC funding. Reports have shown that venture capitalists are making much less investment on entrepreneurs of ethnic or racial minorities.⁵

One cause behind the gap in VC funding is that investors still rely heavily on traditional approaches to find diverse entrepreneurs,⁶ e.g., through connection within their networks.⁷ The PTO could do its part to improve the current situation. For example, first, the PTO could provide more complete and accurate patent records (e.g., gender/ethnic of the applicants) for investors to consider when they are making investment decisions. Second, the PTO could create a counselling panel/committee to provide more insights and relevant information/data for investors who are interested in investing minority-owned businesses but nevertheless lack the connection or information to make a decision. Third, the PTO could lower the innovation cost for minority applicants, including reducing patent application fees and other maintenance fees. Another alternative for the PTO to consider is to host volunteer programs to help reduce or even remove the cost of patent application for under-resourced minority applicants. One example is the World Intellectual Property Organization (WIPO)'s Inventor Assistance Program (IAP).⁸ In 2016, WIPO launched the IAP to help inventors who have great ideas but struggle to obtain patents due to lack of funding. Through this public-private partnership program, WIPO pair those under-resourced inventors with a specialist to help them draft and prosecute their patent applications.⁹

³ *Id.*

⁴ Valentina Zarya, *Venture Capital's Funding Gender Gap Is Actually Getting Worse*, 2017, <https://fortune.com/2017/03/13/female-founders-venture-capital/>

⁵ Mariela Merino, *Venture Capital Funds and the Gap*, 2020. [https://www.crestmontcapital.com/blog/venture-capital-funds-and-the-gap#:~:text=Venture%20capital%20\(VC\)%20funds%20have,percent%20of%20venture%20capital%20money.&text=Most%20venture%20capitalists%20are%20men%20and%20angel%20investors%20are%20too.](https://www.crestmontcapital.com/blog/venture-capital-funds-and-the-gap#:~:text=Venture%20capital%20(VC)%20funds%20have,percent%20of%20venture%20capital%20money.&text=Most%20venture%20capitalists%20are%20men%20and%20angel%20investors%20are%20too.)

⁶ *Beyond the VC Funding Gap*, 2019, <https://www.morganstanley.com/ideas/venture-capital-funding-gap>

⁷ *Id.*

⁸ Allison Mages et al, *Inventor Assistance Program: First Patent Grants to Under-Resourced Inventors*, 2019, https://www.wipo.int/iap/en/news/2019/news_0005.html

⁹ *Id.*

On the applicant side, the PTO could provide patent applicants more information regarding available financial resources. For example, when minority applicants get their patents granted (further criteria to be added, e.g., number/ type/classification of patents obtained), the PTO would advise the applicants about the financial resources they may consider.

Fortunately, despite the fact that VC funding largely goes to white male owned businesses, there are still options for women and other entrepreneurs with minority background, such as Pipeline Angels,¹⁰ Harlem Capital,¹¹ SoGal Ventures,¹² and Founders First Capital.¹³ The gaps in VC funding will continue to exist, but more funding for those minority-owned companies would certainly further their innovation activities.¹⁴

Government Sponsored Awards/Grants

In the US, the government awards billions of dollars every year to small businesses to help them grow. Some of those awards/grants aim at promoting the growth of minority-owned businesses through awarding their innovation activities. For example, the Minority Business Development Agency (MBDA) had organized various grant competitions to support minority-owned businesses with second round financing.¹⁵ Other options for minority-owned business to consider include the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR), both of which are managed by the National Institute of Health (NIH),¹⁶ and are among the largest sources of early-stage capital for technology commercialization in the US, although they are less minority targeted compared to grants provided by MBDA.

Innovation Incubators/Accelerators

Besides government sponsored programs, there are other innovator-facing incubators, accelerators, and university programs focusing on helping minority inventors get investment opportunities. For example, the Multicultural Innovation Lab, run by Morgan Stanley, is an in-house startup accelerator that provides access to capital for early stage technology and technology-enabled companies led by women and multicultural entrepreneurs.¹⁷ Another example is NewME, which is known as one the country's first accelerator programs that provides

¹⁰ <https://pipelineangels.com/>

¹¹ <https://harlem.capital/>

¹² <http://www.sogalventures.com/>

¹³ <https://foundersfirstcapitalpartners.com/>

¹⁴ *Closing Diversity Gaps in Innovation: Gender, Race, and Income Disparities in Patenting and Commercialization of Inventions*, 2018, *Technologies and Innovations*, 19, 727-734, 2018 https://www.cov.com/-/media/files/corporate/publications/2018/06/closing_diversity_gaps_in_innovation_gender_race_and_income_disparities_in_patenting_and_commercialization_of_inventions.pdf

¹⁵ MBDA-OBD-2019-2006047, American Indian, Alaska Native, and Native Hawaiian Project, Department of Commerce <https://www.grants.gov/web/grants/view-opportunity.html?oppld=315200>

¹⁶ <https://sbir.nih.gov/>

¹⁷ Multicultural Innovation Lab, <https://www.morganstanley.com/about-us/diversity/multicultural-innovation-lab#mcil1>

support for entrepreneurs of color.¹⁸ The program offers boot camp training programs and help diverse founders raise VC funding. Other similar programs include Hillman Accelerator,¹⁹ DivInc,²⁰ and Inclusive Innovation Incubator.²¹

For more established accelerators such as Y Combinator, although the company has not specifically set up programs to promote minority-based innovation, its recent move still shows the trend that more investors are aware of the gap in innovation funding and are willing to do more to make a change. For example, in September 2020, Y combinator released three new lists on Black-, Latinx- and women- founded portfolio companies as a part of its startup directory²² designed to allow investors to invest in these companies. Similar to the situation regarding VC funding, the PTO could take a more active part in helping closing the innovation gap by providing more accurate patent records to investors from these programs listed above. It is also very important that PTO plays a dual role in these activities, i.e. on both the innovator side (e.g., providing resource information to patent applicants) and the investor side (e.g., providing accurate and complete patent records to investors).

¹⁸ <https://www.newme.in/>

¹⁹ <https://www.hill7.org/>

²⁰ <https://www.divinc.org/>

²¹ <https://www.in3dc.com/>

²² <https://www.ycombinator.com/companies>

DRIVING INNOVATION INVESTMENT IN MINORITY AND WOMEN INNOVATORS BY TARGETING SMALL BUSINESSES THROUGH THE TAX CODE.

To:	United States Patent and Trademark Office (“USPTO”)
From:	Sajeev Sidher ¹ , LL.M. Student (IP Law) at Santa Clara University School of Law
Date:	February 4, 2021
Re:	Comments Regarding the National Strategy for Expanding American Innovation, Docket No.: PTO-P-2020-0057

Question Addressed

IV.14 - Financial support is a critical element in translating an innovation into commercial success. What organizations, programs, or other efforts help promote access to capital to an expanded group of inventors and entrepreneurs—demographically, geographically, and economically?

Short Answer

Collaborating with the U.S. Department of Treasury to utilize enhanced tax credits and other targeted tax incentives to increase private investment into small businesses particularly minority- and women-owned businesses to drive U.S. innovation broadly.

The USPTO has recognized that financial support is a critical element in translating an innovation into commercial success. Thus, it has asked what organizations, programs, or other efforts can be implemented to help promote access to capital to an expanded group of inventors and entrepreneurs—demographically, geographically, and economically.

I have focused my comment on the use of the tax code to drive innovation based on over two decades of experience in the area of tax law and policy including extensive experience with global tax incentives related to innovation and intangible property development. My experience tells me that global patent boxes, R&D credits and other targeted incentives are powerful tools to attract and drive innovation through increased private investment and employment in related fields. I hope that policy makers will use tax incentives, among others, to drive domestic innovation and bring down long standing barriers that stifle minority and women inventors.

¹ The author is a J.D. and has previously completed a LL.M. in Taxation but submits these comments strictly in his role as student at Santa Clara University School of Law pursuing a LL.M. in Intellectual Property Law and not in any other capacity.

This comment will make the case for using targeted tax policy to drive innovation at small businesses and startups to address a growing Innovation Shortfall² and the Diversity Gap³ with respect to the filing of patents by underrepresented groups. It will argue that implementing generous R&D credits and targeted small business patent boxes will spur more innovation and patent filing writ large and specifically with respect to underrepresented minorities and women. This comment will further recommend that the New Market Tax Credit (“NMTC”) be used as a model to create a private-public investment vehicle to steer financial resources toward minority-owned businesses and inventors. While the focus of this comment is developing and enhancing targeted broad-based tax incentives to drive direct investment, meaningful and permanent changes to broader policies are needed to get investment dollars to minority and women innovators along with finally bringing down other persistent and intolerable societal and systemic barriers.

The growing diversity gap with respect to innovation as a whole and with respect to patents specifically should trouble us all. The patent system is a critical incentive to drive innovation as the resulting exclusive rights allows the inventor to earn a return over the life of the patent commensurate with the inventor’s investment. However, for the individual inventor, a patent as a property right can be the vehicle to generate wealth and secure social and financial upward mobility for the inventor and her family potentially over successive generations. What is clear, however, is that women and underrepresented minorities in the United States are not securing patents at a rate commensurate with others, particularly white men. Although we lack concrete data as to the size of the disparity, it has been reported in a 2018 Harvard University study that whites are over three times more likely to become inventors as African Americans.⁴ An Information Technology and Innovation Foundation survey found African Americans, while making up 13% of the United States “native-born population, comprises less than 1% of the United States born inventors.”⁵ Another study, from Michigan State University, found between “1976 to 2008, African American inventors were awarded six patents per 1 million people, compared to 235 patents per one million for all U.S. inventors.”⁶ It is clear that the Diversity Gap is real as are the consequences.

The persistent Diversity Gap is clearly negatively impacting the US economy. On a macro level, the U.S. is experiencing a sustained Innovation Shortfall as the pace of innovation is slowing. Total factor productivity⁷ (“TFP”), which measures how advancement impacts resource

² The term “Innovation Shortfall” to describe an overall slowing in the pace of innovation.

³ The term “diversity gap” encompasses the imbalance with respect to the filing of patents by underrepresented minorities and women although due to time this comment will more heavily focus on this in connection with underrepresented minorities.

⁴ Alex Bell et. al., *Who Becomes an Inventor in America? The Importance of Exposure to Innovation*, Opportunity Insite, November 2018, at 3, http://www.equality-of-opportunity.org/assets/documents/inventors_paper.pdf.

⁵ Matthew Bultman, *For Black Innovators, Road to Owning Patents Paved with Barriers*, Bloomberg Law, July 14, 2020, <https://news.bloomberglaw.com/ip-law/for-black-inventors-road-to-owning-patents-paved-with-barriers>.

⁶ *Id.*

⁷ Total factor productivity is accounts for increases in the levels of efficiency and technology by measuring the that portion of the growth of a system that is not explained by such things as such as increases in the number of machines, labor, or a more educated workforce and is considered an indicator or long term growth.

consumption and incomes, has fallen from annual an growth of 1.75% per year between 1996 and 2004 to about 0.9 percent since 2005.⁸ The financial and human impact of the Innovation Shortfall is vast including lost overall wages of 51% or about \$18 a hour over the \$35.44 an hour earned by American workers.⁹ While the Diversity Gap does not explain the Innovation Shortfall entirely, it likely has a measurable impact. Specifically, Lisa Cook, a noted economics professor and researcher at Michigan State University, believes that the Diversity Gap eliminates almost \$1 trillion a year from the US economy which might reduce GDP by as much as 4.4% annually.¹⁰ This is a threat to America’s dynamism on many levels and the comprehensive broad-based solutions are needed to reverse this trend.

One of the places where we can have a significant impact on the Diversity Gap and Innovation Shortfall at small businesses and startups. Between 1998 and 2014, small businesses’ share of GDP has gone from 48 percent to 43.5 percent.¹¹ Further, the share of patents awarded to small entities has also declined from 25.9 percent in 2001 to 19.0 percent in 2015.¹² However, it would also appear that the potential pool of minority innovators would be at small businesses as minority-owned businesses in 2012 represent 29.3 percent of all businesses.¹³ Further, U.S. Census Bureau’s Annual Survey of Entrepreneurs showed that the number of minority-owned businesses with paid employees increased by 4.9 percent from 2014 to 2015.¹⁴ In addition, about a quarter of women-owned businesses are minority-owned.¹⁵ Thus, the ability to drive innovation that impacts unrepresented groups should start with targeting small businesses.

As this author’s primary expertise is tax, this comment will be limited to the use of tax incentives to drive investment in small businesses, and startups. As noted in studies, there is a positive correlation between driving innovation and development spending and Federal tax regimes and policies.¹⁶ The same study indicates that the impact from changes to tax rates can

⁸ Roberto Cardarelli and Lusine Lusinyan, I.M.F. Working Paper: U.S. Total Factor Productivity Slowdown: Evidence from the U.S. States, May 2015, at 3.

⁹ Michael Greenstone and Adam Looney, A Dozen Economic Facts About Innovation, The Hamilton Project Policy Memo, August 2011, at 10.

¹⁰ Hyun-Sung Khang, The Accidental Economist, International Monetary Fund, Winter 2020, <https://www.imf.org/external/pubs/ft/fandd/2020/12/profile-of-economist-lisa-cook-michigan-state-university.htm>.

¹¹ U.S. Small Business Administration Office of Advocacy Release, *Small Business Generate 44% of U.S. Economic Activity*, <https://advocacy.sba.gov/2019/01/30/small-businesses-generate-44-percent-of-u-s-economic-activity/>

¹² Scott Shane, Why Small Business Share of U.S. Inventions is Declining, Small Business Trends, October 31, 2016, <https://smallbiztrends.com/2016/10/decline-in-patents-granted-to-small-entities.html>

¹³ SBA Office of Advocacy Release, Frequently Asked Questions About Small Business, Small Business Administration, August 2018, <https://www.sba.gov/sites/default/files/advocacy/Frequently-Asked-Questions-Small-Business-2018.pdf>.

¹⁴ U.S. Census Bureau Release, *Number of Minority-Owned Employer Firms Increased in 2015*, U.S. Census Bureau, July 13, 2017, <https://www.census.gov/newsroom/press-releases/2017/minority-owned-employer-firms.html> (“... a 10 percent change in personal income taxes will reduce patents produced by 6 percent and the quality to a similar extent.”)

¹⁵ *Id.*

¹⁶ Ufuk Akcigit and Stefanie Stantcheva, *Taxation and Innovation: What Do We Know*, National Bureau of Economic Research, November 29, 2020, at 6, <https://www.nber.org/system/files/chapters/c14428/c14428.pdf>

be felt as soon as a year after a change and impact development as long as three years after the change.¹⁷ Thus, tax policy should be considered in addition to other mechanism to drive innovation. Accordingly, I recommend the following approaches and enhancements be considered:

- Adopting a small business patent box regime that would provide a tax holiday or beneficial tax rates related to the taxable profits associated with patented technology developed by small businesses;
- Expanding the R&D tax credit to provide more generous tax credits for a broader base of R&D investments and studying the viability of targeted “super credits” for minority and women-owned businesses; and
- Developing a private/public partnership to drive private equity investments in minority and women-owned businesses using tax credits like the NMTC.

Use of patent boxes is a common approach to incent IP development outside of the United States. A patent box generally provides lower tax rates or tax holidays in connection with taxable profits related to the commercialization of a patent. As of 2015, patent boxes or similar incentives were used in 16 OECD countries.¹⁸ However, there can be issues with patent boxes in their current form as the regime can be used to create harmful tax competition and may not generate sufficient local innovation activities.¹⁹ However, there is also evidence that patent boxes do drive in country innovations and increased patent filing as recent studies indicate that favorable tax treatment under patent boxes attract “high level patents.”²⁰ A separate study found that patent boxes “have a statistically positive effect on ... domestic patent applications in Europe, indicating increases of 10% to 20%”.²¹

In the US, we currently have an overall corporate tax rate of approximately 21% or lower so in many respects our tax rate is very efficient. However, building a patent box for patents developed and filed by small businesses would provide a targeted incentive to spend on development and to patent the results of said development activity as that is a prerequisite for qualifying for the patent box tax rates. A small business patent box regime could for example provide a finite tax holiday (e.g., for 10 years) for patents owned exclusively by small businesses as that term is defined by the SBA on the commercial revenue associated with that patent. Further, to replace the lost tax revenue, qualifying for the patent box should also be predicated on hiring of R&D and production employees in the United States and potentially in specific Enterprise zones. Comprehensive studies should be performed to determine if these incentives

¹⁷ Ibid

¹⁸ Nicholas Bloom, John Reenan and Heidi Williams, *A Toolkit for Economic Policies to Promote Innovation*, Journal of Economic Perspectives, Summer of 2019, 163-184, 171.

¹⁹ *Id.*

²⁰ Cherie Jones, Adam Rogers, Damian Smyth, Should the United States Enact a Patent Box?, The Tax Advisor, November 1, 2016, (see also Alstadsæter, et al., "Patent Boxes Design, Patents Location and Local R&D," Center for Economic Studies and Ifo Institute Working Paper No. 5416 (June 2015)).

²¹ *Id.* (see also Hassbring and Erdwall, "The Short-Term Effect of Patent Box Regimes," p. 37 (May 15, 2013)).

can also be targeted specifically to minority and women-owned businesses in a way that addressed the Diversity Gap.

The second prong to driving investment toward small business innovators is to increase the reach of the R&D tax credit. The R&D tax credit allows a taxpayer a tax credit of 20% on research-related expenses. However, this credit is predicated on the incremental increase in R&D spending over a defined period and not on the annual R&D spending.²² For small to mid-sized companies, R&D credits can be used to reduce alternative minimum tax and for “qualified small businesses,” the credit can be used as a credit against the employer’s share of Social Security taxes (up to \$250,000).²³ Although seemingly generous, the R&D credit actually has significant limitations as the qualifying activities exclude, for example, research conducted after the product is in production and any research in the social sciences, arts, or humanities.²⁴

These limitations along with how the credit is calculated has resulted in the U.S. tax credit being rated at the bottom one-third of OECD nations (e.g., the credit reduced US R&D costs by about 5 percent). For comparison, France, Portugal and Chile all have more generous R&D incentives that reduce their inventors costs of R&D by 30%.²⁵ It is clear that the R&D credit, at least with respect to small businesses, needs to be revamped to be based on the actual R&D spending rather than incremental spending and the nature of the R&D included should be expanded. In addition, the levels of which the R&D credits can be used against payroll taxes should also be expanded. At least a detailed study should be conducted on ways to drive more innovation spending by small business especially minority owned or women owned businesses including looking at supercharging the credits if combined with commercial activities that drive economic growth in areas more hard hit by economic disruption such as areas designated as enterprise zones.²⁶

Lastly, a specific private/public partnership modeled after the NMTC to drive private equity investments toward minority and women innovators should be studied. The NMTC is designed to attract private capital into low-income communities by permitting individual and corporate investors to receive a tax credit against their federal income tax in exchange for making equity investments in specialized financial intermediaries called Community Development Entities (CDEs).²⁷ These programs replace direct federal grants by incenting private sector

²² 26 U.S.C. §41(a)(1).

²³ See generally 26 U.S.C. §41(h) and The Protecting Americans From Tax Hikes Act of 2015 (PATH Act), P.L. 114-113.

²⁴ 26 U.S.C. §41(d)(1)

²⁵ See generally T.D. 9600, 26 CFR 1. See also 26 U.S. §1.45D and Treas. Reg. §1.45D-1.

²⁶ Note that H.R. 520 from the 116th Congress made some useful changes to the R&D credit including a modification of the refundable research tax credit for new and small businesses by increasing the limit on payroll tax refundability to \$500,000, with an adjustment for inflation, allowing refundable amounts to cover all payroll taxes paid by such businesses; and extending eligibility for the credit to small businesses with less than \$10 million in gross receipts (currently, it is less than \$5 million). This is a credible start and the new Congress should take up this bill and expand the credit to include a broader range of activities along with a change on how the credit is determined.

²⁷ <https://www.cdfifund.gov/programs-training/programs/new-markets-tax-credit>

investment in CDEs, who then finance commercial activities. The investor receives a 39 percent credit on the original investment amount which is claimed over a period of seven years.²⁸ According to the Federal Government, \$1 invested by the Federal government in the NMTC Program generates over \$8 of private investment of which 75% get spent in highly distressed areas.²⁹ This approach should be adapted to innovation to drive additional private investment through “Community Innovation Entities” that would act as regional investment hubs that provide the capital necessary to drive innovation and ultimately patent applications by minority and women inventors.

In the end, this comment is just a small survey of potential levers that can be used to funnel resources and capital to the innovators of the future. The Diversity Gap along with the Innovation Shortfall is real. Both issues need to be addressed and I offer these potential tax reforms as part of the solution for your consideration.

²⁸ 25 U.S.C. §45D(a)(1)-(3).

²⁹ See generally <https://ajed.assembly.ca.gov/establishinganewmarketstaxcreditincalifornia>.

BOOSTING INNOVATION THROUGH CONFERENCE PARTNERSHIPS

To:	United States Patent and Trademark Office (“USPTO”)
From:	Dalton Chasser, M.S. Biomedical Engineering, 2L Law Student at Santa Clara University School of Law
Date:	February 4, 2021
Re:	Comments Regarding the National Strategy for Expanding American Innovation, Docket No.: PTO-P-2020-0057

Question Addressed

IV.16 - Formalized partnerships like tech transfer offices/conferences, accelerators, and incubators can help streamline commercialization objectives such as product development, licensing, and distribution. What can be done to make these partnerships more accessible and effective at supporting all inventors and entrepreneurs?

Short Answer

The PTO can increase inventor commercialization in three ways as it relates to conferences: 1) tap into its current partnerships already in place to lower costs for innovators through the PTO, 2) create new partnerships with other conferences, and 3) offer more inclusive USPTO-hosted events.

My name is Dalton Chasser, and in these comments I draw primarily from my student experience of financial insecurity throughout undergrad. I am the first engineer in my family and draw primarily from my undergraduate experience with conferences and when I worked at the USPTO as a summer extern during my junior year. The main reason I wanted to study engineering was to develop my own products and start my own company. The lack of network and accessibility to reach new audiences was one main reason why that ambition dissipated.

The USPTO has asked what can be done to make formalized partnerships, such as tech transfer offices/conferences, accelerators, and incubators which help streamline commercialization objectives such as product development, licensing, and distribution, more accessible and effective at supporting all inventors and entrepreneurs.

My comments identify where the problems of conference accessibility arise from and further explain how the lack of private outreach and connections with private sector conferences inhibits student inventors, small businesses, independent inventors, minority- and veteran-owned businesses/inventors from achieving innovation efficiency. Finally, I suggest methods that that USPTO can implement to achieve higher accessibility through their own events and initiatives.

Current Landscape on Conference/Convention Accessibility

Overview:

Conferences are an excellent way for students, independent inventors, and entrepreneurs to translate their ideas and connect with a network in order to streamline commercial objectives. Conferences make it much easier to connect with other similar professionals and are a crucial vehicle in expanding and fostering innovation overall. However, “business tourism”, or the conference industry, costs far too much for many groups.¹ Figure 1 gives a brief cost overview of 10 well-known technology transfer and innovation conferences in various fields and what the price to attend would be

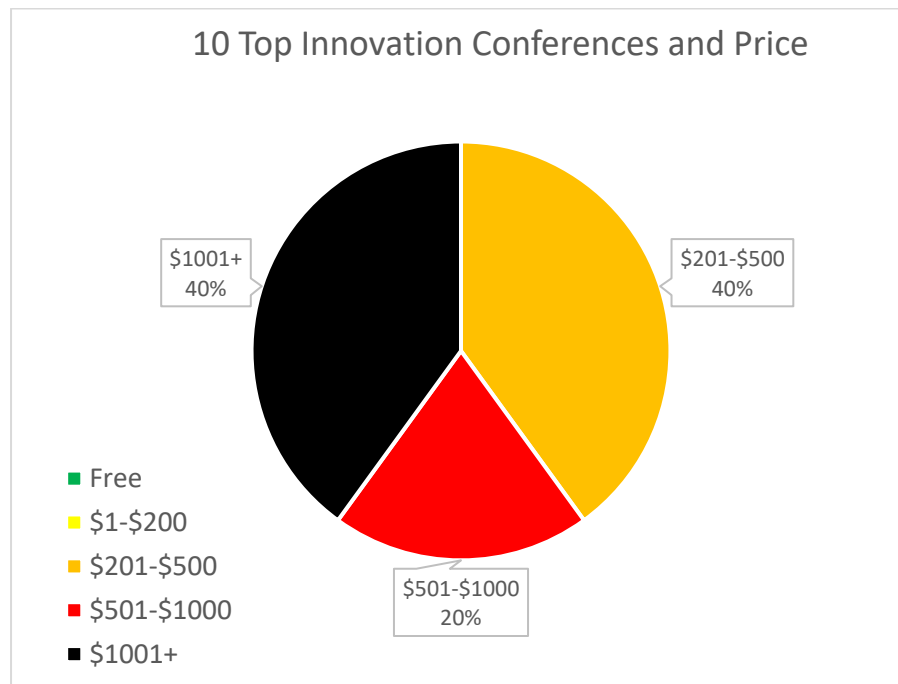


Figure 1. Cost breakdown and comparison of some of the top innovation conferences. Conferences included: CES, BIO, AUTM, Startup Grind Global, SaaStr, SASX, Growth Hackers, JP Morgan Healthcare, Collision, and Dreamforce.

Identified here are two problems. The first problem is that these conferences cost a lot for any startup inventor, minority inventor, let alone students. Students, even offspring from the middle class, struggle to pay for many of the necessities that a university requires (e.g. tuition, housing, textbooks, food, etc.), so spending extra money to attend a conference, let alone the

¹ Rogers, Tony. *Conferences and Conventions a Global Industry*. Routledge, 2013.

housing/travel costs is more than unlikely to occur. Financial insecurity for students is a well-documented current issue.²

The opportunity to go to a conference is thus limited to a very select group of groups, yet would provide one of the best mechanisms to initiate innovation growth. The two main methods for students who wish to attend thus are limited to those individuals who either 1) find a lab/professor that they do research with who is willing to pay for them to attend or 2) are not financially insecure. Since many groups are marginalized in both school acceptance and financially³, it's even more unlikely that they will ever attend a conference.

As it relates to marginalized groups, the same is true. Even if they are ambitious and diligent innovators, it's likely that they do not have the resources to attend these events. Furthermore, it's likely that they have a disadvantage when it comes to acquiring the resources necessary to initiate commercial objectives.

Solution:

The USPTO could be utilized as a tool for implementing formalized partnerships with specific conferences which could result in lower cost attendance and more inclusiveness. In fact, the USPTO already does the first half of this with AUTM and CES⁴, but individuals still have to pay the conference's registration fee to access the USPTO's exhibits at those conferences. In my personal experience, even when I was a student employee at my undergraduate school's tech transfer office, I had to pay an extremely high price if I wanted to attend AUTM's event. The USPTO should utilize its current partnership to leverage accessible payment pricing for events like this.

As it relates to free conferences, the USPTO already does a commendable job at offering very useful events for innovators. In 2020 alone, the USPTO offered 450+ total events.⁵ Even so, these events are disconnected from any conference that a typical student or group of independent inventor would attend. For example, in 2020, the USPTO offered an events such as "Innovators and entrepreneurs: Learn about IP basics and helpful resources" in Detroit, MI. The event covered basics of IP and why innovators should protect their IP, and offered local resources and assistance available through the USPTO. This was probably an excellent event, but it could be improved through formalized partnerships with the private sector. The totality of these events is geared toward educating inventors as opposed to networking and expanding resources as others in the conference space already do. I personally attended about 10 such events when I externed at the PTO. Thus, there is a great need for the connection to the private sector and its available resources for inventors.

² Nazmi, Aydin and Suzanna Martinez. "A Systematic Review of Food Insecurity among US Students in Higher Education." *Journal of Hunger & Environmental Nutrition*, vol. 2014, no. 5, ser. 2019, 22 June 2018. 2019.

³ Marcus, Jon. "Facts about Race and College Admission." *The Hechinger Report*, 30 Mar. 2020, hechingerreport.org/facts-about-race-and-college-admission/.

⁴ Partner with AUTM, autm.net/about-tech-transfer/partnerships/uspto.

⁵ <https://www.uspto.gov/about-us/events>.

Looking at the total events that the USPTO offered as they relate strictly to inclusiveness is also concerning. There were 450+ events that the USPTO hosted for free, many of which are related to working with the USPTO on specific, tangible business activities (e.g. “Learn how to search patents”, “IP basics and helpful resources”, etc.). However, the list for inclusive innovation in 2020 specifically only included: 27 events tailored to small businesses, 2 events related to pro bono resources, 2 events in celebration of Black History Month, 3 events related to gender diversity/Women in IP, 4 K-12 events, 1 Veteran event, and 1 Hispanic event.⁶ The USPTO could therefore improve its own inclusive educational events by offering more events tailored to inclusion.

⁶ <https://www.uspto.gov/about-us/events>.

RECOMMENDATION OF CONDUCTING IN-DEPTH STUDY ON PATENTS WITH ALL-WOMAN INVENTOR TEAMS

To:	United States Patent and Trademark Office (“USPTO”)
From:	Anonymous, 3L Law Student at Santa Clara University School of Law
Date:	February 4, 2021
Re:	Comments Regarding the National Strategy for Expanding American Innovation, Docket No.: PTO-P-2020-0057

Question Addressed

V.18 - Please provide any other comments that you feel should be considered as part of, and that are directly related to, the development of a national strategy to expand the innovation ecosystem demographically, geographically, and economically.

Short Answer

Inventor(s) that are composed of women-inventors only (either a team of all-women inventors or solo woman inventor) are most underrepresented in the US patent system. Understanding the specific challenges that this group of all-women inventors face while trying to secure their IP rights is important to find any root causes of the underrepresentation and promote equality among genders. Thus, I suggest conducting an in-depth study on patents with all-woman inventor teams.

I hereby provide my comments in response to “Request for Comments on the National Strategy for Expanding American Innovation” from the United States Patent and Trademark Office (USPTO), Department of Commerce. In particular, my comments are directed to Question No. 17 that inquires comments that may need to be considered as part of, and that are directly related to, the development of a national strategy to expand the innovation ecosystem demographically, geographically, and economically.

Introduction

I highly appreciate that the USPTO has awareness of disparities for women and minorities in the US patent system and conducted the relevant study of underrepresented classes under the name of “Success Act of 2018,” along with U.S. Small Business Administration (“SBA”.) I am a US patent agent holding an active registration and have been practicing the patent law for about thirteen years. My past experiences include working as a patent scientist and agent in two major, IP-specialized US law firms and as an in-house legal member from a fortune 500, life science company from the Bay area.

In this submission, I would like to propose an in-depth study on patents with all-women inventors (in other words, inventors who are all women) because of the greatest and long-standing inequality that is uniquely present in this group of inventors. While my comments in this submission will focus on cases from women inventors but can also be applied to cases with other underrepresented groups experiencing heightened disparity.

Extreme Inequality In Patents Filed By All-Women Inventors

As shown from the report of Success Act of 2018 by the USPTO, the percentage of women being inventors is still notably lower than men, although it has been showing some progress¹. The report presents two types of data, a percentage of patents with at least one woman inventor and a percentage of women inventor rate. Interestingly, there is a significant difference between the two data points. For the year of 2016, the first percentage appears to be about 22% whereas the second percentage appears to be just about 12%. This can be interpreted, at least in one way, that the number of patents that list one or more inventors being women has increased with a higher rate, but the overall number of women inventors is much slowly growing. This also means that there are more patent cases where a mixed team of men and women is inventors but the cases where only a team of women or a solo woman is an inventor may have not been increased as much.

The foregoing interpretation can be confirmed when it is viewed with a gender breakdown of inventors. According to the 2019 report from the UK Intellectual Patent Office on “Gender profiles in worldwide patenting: an analysis of female inventorship,” more than three-fourths (about 77%) of all patents filed from 1998-2017 in the U.S. come from all-male teams or individual male inventors and just about 3% from individual female inventors.² What is more shocking is all-female teams are nearly non-existent, less than 1% of applications. Further importantly, these categories of women inventors have been showing small (about 2% to 5.5% from ‘all women team inventors’ group) to no (consistently less than 1% from ‘sole woman inventor’ group) progress in equality for the 20 years of period (1998-2017)³ while the mixed group of men and women inventors increased from about 7% in the 1980s to 21% by 2016⁴.

This apparent gender inequality is very consistent with my personal experiences from about 10-years of practices in law firms. While there were many men inventors (more than a hundred) who were from all different forms of entities including large to small corporations, start-ups and one-person businesses, I personally did not have a single occasion where women-only clients, either solo or in group, came and sought patent protection.

¹ See Figure 2 from <https://www.uspto.gov/sites/default/files/documents/USPTOSuccessAct.pdf>

² See Figure 10 from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/846363/Gender-profiles-in-worldwide-patenting-2019.pdf

³ See Figure 8, *l.d.*

⁴ See Figure 1 and description from <https://www.uspto.gov/sites/default/files/documents/Progress-and-Potential.pdf>.

In-Depth Study of All-Women Inventor Group

In view of the foregoing, it is apparent that there is extreme inequality of women inventors, especially in patent cases where all inventors are composed of women. Further, there has been almost no positive changes within this group toward equality for the past several decades. This observation raises a high demand of in-depth study of this particular group (women-only inventors). Some interesting questions directed to this group of inventors may include as follows:

From financial perspective:

- Entity status (micro-, small- or large entity) of patent cases filed by all-women inventors;
- Financial sources used to pay for legal cost; and
- Financial structure and investment entities of business that are covered by patents.

From technology perspective:

- Technology fields identified from patent cases filed by all-women inventors;
- USPTO's technology centers assigned to patents cases with all-women inventors; and
- Inventor's educational and technical experiences and background.

From business perspective:

- Type of business (*e.g.*, sole-proprietorship, partnership, private or public corporation, profit or non-profit, universities, or governments);
- Certain details of business (*e.g.*, location of business and headquarter, number of employees, duration of business, revenue, profits, locations of manufacturing and sales, and more);
- Procedures and individuals that are involved in making decisions for patent filing and strategy; and
- Any impacts on business before and after patent filing and/or grant.

From cultural and educational perspective:

- Race;
- Economic status;
- Educational background;
- Previous exposure to technology and/or innovation;
- Previous exposure to the concept of IP and patent; and
- Sources of information from which the inventors learn about IP; and
- Personal and professional network relating to business and law.

From inherent bias perspective⁵:

- Duration of prosecution and number of rejections in patent case filed by all-women inventors;
- Average number of interviews conducted during prosecution;
- Average number of appeals filed and success rate thereof;
- Average allowance rate; and
- Percentage of women inventors who remain active after filing and grant of patents.

Comparative studies would be particularly helpful if the answer to any of the foregoing questions exhibits substantial difference between the women-only inventor group and other groups of inventors.

I expect the study suggested herein can shed some light on the roots of extreme and persistent inequality present in the women-only inventor group, the unique challenges that those inventors have faced or anticipate, and the effective means to reduce or eliminate the gender disparity.

⁵ It would be interesting to verify if the applications filed from the women-only inventor group shows a lower grant rate as compared to other groups of inventors, as suggested by the study from Yale University. See <https://insights.som.yale.edu/insights/why-do-women-inventors-win-fewer-patents#gref>