Georgia State University Law Review

Volume 36
Issue 3 *Spring 2020*

Article 8

6-1-2020

From Photocopying to Object-Copying in the Classroom: 3D Printing and the Need for Educational Fair Use in Patent Law

Alessandra T. Palazzolo
Georgia State University College of Law, apalazzolo1@student.gsu.edu

FROM PHOTOCOPYING TO OBJECT-COPYING IN THE CLASSROOM: 3D PRINTING AND THE NEED FOR EDUCATIONAL FAIR USE IN PATENT LAW

Alessandra T. Palazzolo*

INTRODUCTION

Globalization impacts the American workforce by creating jobs in the technical sector while stunting the growth of jobs in other sectors.[1] In response to these workforce changes, education is shifting from a traditional model, which focuses on the humanities, to a model focusing on STEM education, which emphasizes science, technology, engineering, and mathematics.[2] In 1976, Congress

---

* J.D. Candidate, 2020, Georgia State University College of Law. B.S. History, Technology, and Society, 2014, Georgia Institute of Technology. Thanks to Professor Deven Desai for providing guidance on how to approach this issue and my fellow *Georgia State University Law Review* executive board members for all their hard work. Most importantly, thank you to my parents for supporting me throughout this process and for inspiring my interest in how technology affects society.

1. Larry Alton, *Workplace Changes Are Accelerating: Why and What Millennials Should Do About It*, FORBES (Feb. 1, 2018, 8:00 AM), https://www.forbes.com/sites/larryalton/2018/02/01/workplace-changes-are-accelerating-why-and-what-millennials-should-do-about-it/#55501e4a2def [https://perma.cc/6MRB-YZTR]; *Four Ways Globalization Affects American Workers,* WORKINGNATION (Oct. 12, 2016), https://workingnation.com/four-ways-globalization-affects-american-workers/ [https://perma.cc/3SDN-EELU]. According to the Economic Policy Institute, the United States lost 3.2 million manufacturing jobs between 2001 and 2013—in part due to globalization. *Four Ways Globalization Affects American Workers*, *supra*. It is estimated that between 2017 and 2027, STEM jobs will grow in the United States by 13%, while jobs in other sectors will only grow by 9%. *Vital Signs United States*, EDUC. COMMISSION STATES, http://vitalsigns.ecs.org/state/united-states/demand [https://perma.cc/7UN5-B5EL] (last visited Nov. 4, 2018). The median hourly earnings for STEM jobs in the United States is \$38.85 per hour, while the median hourly earnings for all other United States jobs is \$19.30 per hour. *Id.* Meanwhile, in 2014–2015 only 25.6% of post-secondary graduates in the United States received a degree in a STEM field. *Id.*

2. David W. White, *What Is STEM Education and Why Is It Important?*, 1 FL. ASS'N. TCHR. EDUCATORS J. 1, 1 (2014); Adam Frank, *What Is the Value of an Education in the Humanities?*, NPR (Feb. 2, 2016, 4:05 AM), https://www.npr.org/sections/13.7/2016/02/02/465239105/what-is-the-value-of-an-education-in-the-humanities [https://perma.cc/V85P-5YVW]; *Science, Technology, Engineering and Math: Education for Global Leadership*, U.S. DEP'T EDUC., https://www.ed.gov/stem [https://perma.cc/QY66-SWXX] (last visited Nov. 4, 2018). The Department of Education published the following mission statement regarding STEM education:

> The United States has developed as a global leader, in large part, through the genius and hard work of its scientists, engineers, and innovators. In a world that's becoming increasingly complex, where success is driven not only by *what* you know, but by what you *can do* with what you know, it's more important than ever for our youth to

passed the Copyright Act, which included a fair use exception for educational purposes.[3] The educational exception focused on the technology of the time—the photocopier—to offer protections to teachers photocopying poems, stories, and other written works for their students.[4] With the focus of education changing to STEM subjects, the protections offered to teachers must also be extended to methods of STEM instruction, including additive manufacturing—commonly referred to as 3D printing. Although there are currently open platforms available where educators can access open-computer-aided design (CAD) files for unpatented objects, the "digitization of things" will likely drive these platforms to become restricted—forcing teachers, particularly those in higher education, to resort to printing patented objects as demonstratives for educational purposes.[5] Educators concerned about patent infringement claims may stop using 3D printers in their classroom. Thus, the Legislature must consider methods to protect educators—as they did in 1974 for educators using photocopiers—who want to 3D print patented objects in STEM education.[6]

From children's toys to firearms, to human tissue and aircrafts, 3D printing is almost limitless in its production possibilities.[7] Although

---

> be equipped with the knowledge and skills to solve tough problems, gather and evaluate evidence, and make sense of information. These are the types of skills that students learn by studying science, technology, engineering, and math—subjects collectively known as STEM.

Id.

3. 7 U.S.C. § 107 (1976) (current version at 17 U.S.C. § 107 (2018)); H.R. REP. NO. 94-1476, at 66 (1976).

4. H.R. REP. NO. 94-1476, at 66; 4 MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT § 13.05 (Matthew Bender rev. ed. 2018); Michael G. Anderson & Paul F. Brown, *The Economics Behind Copyright Fair Use: A Principled and Predictable Body of Law*, 24 LOY. U. CHI. L.J. 143, 166 (1993).

5. Deven Desai & Gerard N. Magliocca, *Patents, Meet Napster: 3D Printing and the Digitization of Things*, 102 GEO. L.J. 1691, 1691 (2014); Luca Di Angelo et al., *Can Open-Source 3D Mechanical CAD Systems Effectively Support University Courses?*, 32 INT'L J. ENGINEERING EDUC. 1313, 1313 (2016); Lauren Fram, *10 Open-Source and Free CAD Software You Can Download Right Now* (May 18, 2018), https://learn.g2crowd.com/free-cad-software [https://perma.cc/J7VM-XTJH]; *Thingiverse Featured*, THINGIVERSE, https://www.thingiverse.com/ [https://perma.cc/9UNX-LVQ6] (last visited Nov. 4, 2018).

6. 7 U.S.C. § 107; H.R. No. 94-1476, at 66; John Wm. Maddox, *Copyright Violation and Personal Liability in Education: A Current Look at "Fair Use,"* 1995 BYU EDUC. & L.J. 97, 100 (1995).

7. ANDREAS GEBHARDT & JAN-STEFFEN HÖTTER, ADDITIVE MANUFACTURING: 3D PRINTING FOR PROTOTYPING AND MANUFACTURING 3 (2016); Lawrence E. Murr, *Frontiers of 3D Printing/Additive*

manufacturers are slow to adopt large-scale additive manufacturing, forecasters predict that additive manufacturing will revolutionize the manufacturing industry as the technology becomes cheaper and more accessible.[8] Fueled by 3D printing's widespread coverage in the popular press, there is broad public awareness of advancements in additive manufacturing technology, further stimulating interest and innovation. For instance, in 2013, the additive manufacturing global market was valued at $2.3 billion.[9] This figure is expected to jump to $8.6 billion by 2020.[10] In addition to industrial manufacturing, additive manufacturing's next hypothesized frontier is the consumer's home.[11]

Rapid changes in additive manufacturing will lead to the digitization of things.[12] As Professors Deven Desai and Gerard N. Magliocca explain:

> [W]hen the costs drop and a wide range of businesses and people can use the power of digitization—business and legal realities shift dramatically. Disruption is not only a

---

Manufacturing: From Human Organs to Aircraft Fabrication, 32 J. MATERIALS SCI. & TECH. 987, 988, 994 (2016); Emily Dreyfuss, *3-D Printed Gun Blueprints Are Back, and Only New Law Can Stop Them*, WIRED (Aug. 29, 2018, 3:25 PM), https://www.wired.com/story/3-d-printed-gun-blueprints-return-laws-injunction/ [https://perma.cc/6BKZ-5MYT]; Martin Lansard, *3D Printing for Toys*, ANIWAA (Feb. 27, 2020), https://www.aniwaa.com/3d-printing-for-toys/ [https://perma.cc/5VSY-NTRH].

8. GEBHARDT & HÖTTER, *supra* note 7. "3D Printing is also the brand name of a family of powder binder processes . . . ." *Id.*; Dara G. Schniederjans, *Adoption of 3D-Printing Technologies in Manufacturing: A Survey Analysis*, 183 INT'L J. PRODUCTION ECON. 287, 287 (2017); Ching-Chiang Yeh & Yi-Fan Chen, *Critical Factors for Adoption of 3D Printing*, 132 TECH. FORECASTING & SOC. CHANGE 209, 209 (2018); John Pletz, *3-D Printing Is Coming to the Factory—Really*, CRAIN'S CHI. BUS. (Aug. 23, 2018, 6:14 AM), http://www.chicagobusiness.com/innovators/3-d-printing-coming-factory-really [https://perma.cc/JZ8Y-U9FA]. Lou Rassey, CEO of Fast Radius, explained: "Previously, parts weren't good enough, production was too slow and the cost was too high . . . . We've crossed that threshold." *Id.*

9. Franciszek Hasiuk, *Making Things Geological: 3-D Printing in the Geosciences*, 24 GSA TODAY 28, 28 (2014); Yeh & Chen, *supra* note 8.

10. Yeh & Chen, *supra* note 8.

11. Nidhi Bhawsar, *Demand for Consumer 3D Printing Market Is Growing at Exponential Rate by 2023*, BUZENGINE (Sept. 22, 2018), https://buzengine.com/demand-for-consumer-3d-printing-market-is-growing-at-exponential-rate-by-2023-key-players-arcam-ab-asiga/ [https://perma.cc/EL2G-Y3PS]; Jeff Kerns, *Efficient Engineering: Will You Be Downloading 3D-Printed Products Directly from Amazon?*, MACHINEDESIGN (May 11, 2018), https://www.machinedesign.com/3d-printing/efficient-engineering-will-you-be-downloading-3d-printed-products-directly-amazon [https://perma.cc/MR8A-MJD2].

12. *See generally* Desai & Magliocca, *supra* note 5.

> business or private matter; the underlying legal system is disrupted as well. 3D (or additive) printing brings the promise and challenge of digitization to tangible goods. Many copyright and trademark-based industries have faced digitization, but patent-based industries have not. Advances in 3D printing technology are launching an Industrial Counter-Revolution, and the laws governing the way things are made will need to make peace with the reality of digitized objects and on-demand fabrication.[13]

Thus, additive manufacturing could be the catalyst that ignites a mass shift in patent law, including carving out a fair use defense in patent law similar to the defense in copyright law.[14]

A unique aspect of the growth of additive manufacturing is its role in the Maker Movement, and inversely, the Maker Movement's role in the development of consumer additive manufacturing technology.[15] Many members of the Maker Movement share additive manufacturing files and use open-source digital platforms.[16] Because

---

13. *Id.* at 1692. Professors Desai and Magliocca further predict that:

> Patent law relies, in part, on the premise that the cost to infringe is relatively high, but 3D printing challenges that assumption. The Industrial Revolution and the parallel growth of intellectual property laws supporting that economy were driven by economies of scale. Plenty of capital was necessary to support research, production, and distribution, and therefore any serious infringement also required a substantial investment. That nineteenth-century model is crumbling. Copyright was the canary in the coalmine. Once music, film, and books were digitized, those industries were transformed. Production costs fell. Distribution became fast, cheap, and on-demand. Many new players entered the market. Patent is starting down that same road. In short, digitization has reached the rest of the economy—the economy of things.

Id. at 1693–94.

14. *Id.* at 1716. *See generally* Lorelei Ritchie De Larena, *What Copyright Teaches Patent Law About "Fair Use" and Why Universities Are Ignoring the Lesson*, 84 OR. L. REV. 779, 802 (2005).

15. Joel West & George Kuk, *The Complementarity of Openness: How MakerBot Leveraged Thingiverse in 3D Printing*, 102 TECHNOLOGICAL FORECASTING & SOC. CHANGE 169, 172 (2016); Jeremiah Owyang, *Maker Movement and 3D Printing: Industry Stats*, WEB-STRATEGIST (Feb. 13, 2014), http://www.web-strategist.com/blog/2014/02/13/maker-movement-and-3d-printing-industry-stats/ [https://perma.cc/7SCS-AFP6].

16. Tim Bajarin, *Why the Maker Movement Is Important to America's Future*, TIME (May 19, 2014), http://time.com/104210/maker-faire-maker-movement/ [https://perma.cc/5AA8-842C]; Joshua Pearce, *How Maker Communities Align with Open Source*, OPENSOURCE.COM (Nov. 14, 2016), https://opensource.com/life/16/11/maker-open-source-communities [https://perma.cc/83H9-8R24]; Dan Schawbel, *Chris Anderson: How the Makers Will Create a New Industrial Revolution*, FORBES (Oct. 4, 2012, 2:44 PM), https://www.forbes.com/sites/danschawbel/2012/10/04/chris-anderson-how-the-

of the Maker Movement's open-source sharing, 3D printing is a collaborative technology people can use to build off of one another's innovations.[17] 3D printing's open-sharing culture is bound to change once additive manufacturing becomes more prominent.

This Note is broken into three parts. Part I includes background information about additive manufacturing, the Maker Movement and its importance in the promotion of STEM education, and the history of copyright and patent law. Part II analyzes the development of fair use in copyright law, potential reasons that patent law has no statutory fair use defense, and one exception in patent law that is essentially fair use—the Hatch-Waxman Act, a codified version of the experimental use exception for the pharmaceutical industry.[18] Finally, Part III offers three distinct solutions aimed at protecting educators who use 3D printing in their curriculum.

---

makers-will-create-a-new-industrial-revolution/#4f23d8d32a76 [https://perma.cc/KZ82-6D47]. Chris Anderson, formerly the editor in chief of Wired Magazine, offered the following example of the Maker community's abilities to influence technology:

> Drones used to be the sole domain of aerospace companies and the military. It took very sophisticated electronics. My community, DIY Drones, was created to experiment with an alternative: cheap electronics and open source, following the Arduino movement, where people came from around the world to create something. And we used the Arduino platform to change something which in this case was a bottom-up approach to the aerospace industry.

Schawbel, *supra*. The Maker Movement community's interconnectedness was threatened in October 2012, when Nathan Myhrvold's patent for a "manufacturing control system" was issued, patenting digital rights management for 3D printers. Antonio Regalado, *Nathan Myhrvold's Cunning Plan to Prevent 3-D Printer Piracy*, TECH. REV. (Oct. 11, 2012), https://www.technologyreview.com/s/429566/nathan-myhrvolds-cunning-plan-to-prevent-3-d-printer-piracy/ [https://perma.cc/P3KE-33R8]; Bruce Sterling, *Nathan Myhrvold Patents Digital Rights Management for 3D Printers*, WIRED (Oct. 11, 2012, 3:35 PM), https://www.wired.com/2012/10/nathan-myhrvold-patents-digital-rights-management-for-*3d-p*rinters/ [https://perma.cc/PWY3-VHWA]; Michael Weinberg, *DRM on 3D Printers Is a Big Deal. Nathan Myhrvold's Patent Is Not.*, PUB. KNOWLEDGE (Oct. 22, 2012), https://www.publicknowledge.org/news-blog/blogs/drm-3d-printers-big-deal-nathan-myhrvolds-pat [https://perma.cc/8LNC-D46V]. Myhrvold's threat has yet to be implemented and the Maker Movement has only grown larger and more powerful, with the community's ideology being found in classrooms and universities across the nation. Dale Dougherty, *The Maker Movement*, 7 INNOVATIONS: TECH. GOVERNANCE GLOBALIZATION 11, 11 (2012); David Doucette, *Maker Movement Teaches 21st-Century Skills and Encourage Innovation*, EDTECH MAG., (July 11, 2017), https://edtechmagazine.com/higher/article/2017/07/maker-movement-poised-thrive-higher-education [https://perma.cc/XRX5-X843]; Gaby Galvin, *Makers Movement Changes the Educational Landscape*, U.S. NEWS, (May 22, 2017, 5:13 PM), https://www.usnews.com/news/maker-cities/articles/2017-05-23/makers-movement-changes-the-educational-landscape [https://perma.cc/2RB6-AHHP].

17. Dougherty, *supra* note 16, at 12.

18. Hatch-Waxman Act, 35 U.S.C. § 271(e)(1) (2018).

I. Background

First, this background section gives a historical perspective on the development of the fair use exception in copyright law. Then, it delves into the way that additive manufacturing works. Finally, it discusses the Maker Movement generally and focuses on its effect in schools.

A. Historical Origin of Copyright and Patent Law

"Copyright and patent law are sister bodies of jurisprudence," which the founding fathers "placed hand-in-hand" together in the Intellectual Property Clause of the Constitution.[19] The origins of copyright and patent law were further intertwined in 1790 when Congress enacted their first respective acts together.[20] In 1841, Justice Story explained in *Folsom v. Marsh* that copyright and patent law had similar legal considerations by noting, "Patents and copyrights approach, nearer than any other class of cases belonging to forensic discussions, to what may be called the metaphysics of the law, where the distinctions are, or at least may be, very [subtle] and refined, and, sometimes, almost evanescent."[21] Because of their close

---

19. Ritchie De Larena, *supra* note 14. The Intellectual Property Clause of the United States Constitution gives Congress the power "[t]o promote the [p]rogress of [s]cience and useful [a]rts, by securing for limited [t]imes to [a]uthors and [i]nventors the exclusive [r]ight to their respective [w]ritings and [d]iscoveries." U.S. CONST. art. I, § 8, cl. 8.

20. Copyright Act of 1790, Pub. L. No 1–15, 1 Stat. 124 (prior to 1802 amendment); Patent Act of 1790, Pub. L. No. 1–7, 1 Stat. 109 (repealed 1793); Ritchie De Larena, *supra* note 14; Joshua I. Miller, *Towards a Doctrine of Fair Use in Some of Patent Law*, 2 INTELL. PROP. BRIEF 56, 56 (2012).

21. Folsom v. Marsh, 9 F. Cas. 342, 344 (C.C.D. Mass. 1841). Justice Story continued by stating:

> In many cases, indeed, what constitutes an infringement of a patented invention, is sufficiently clear and obvious, and stands upon broad and general agreements and differences; but, in other cases, the lines approach very near to each other, and, sometimes, become almost evanescent, or melt into each other. So, in cases of copyright, it is often exceedingly obvious, that the whole substance of one work has been copied from another, with slight omissions and formal differences only, which can be treated in no other way than as studied evasions; whereas, in other cases, the identity of the two works in substance, and the question of piracy, often depend upon a nice balance of the comparative use made in one of the materials of the other; the nature, extent, and value of the materials thus used; the objects of each work; and the degree to which each writer may be fairly presumed to have resorted to the same common sources of information, or to have exercised the same common diligence in the selection and arrangement of the materials.

Id.

relationship, several patent law doctrines, including misuse, contributory infringement, licensee estoppel, and first sale have been adopted by copyright law.[22]

Historically, there were certain common law doctrines in patent law that were similar to copyright's fair use doctrine, including the common law research exemption, the experimental use defense, the experimental use exemption, and the experimental purpose doctrine.[23] However, there is no statutory fair use doctrine for patent law, and moreover, courts have not recently given judicial recognition to the common law fair use doctrines in patent law.[24]

B. Additive Manufacturing

Since additive manufacturing first emerged in the 1980s, the technology experienced rapid innovation.[25] Now, there are approximately 300 different 3D printers available on the market, ranging from $300 hobbyist printers to HP's recently announced Metal Jet printer, which has the capability to print at industrial volumes and at automotive-grade quality.[26] Additive manufacturing systems turn CAD files into three-dimensional objects by adding feedstock material, such as plastic, metal, or mineral materials, layer by layer until the desired shape is formed.[27] Two main application levels comprise 3D printing: (1) rapid prototyping, making prototypes and models, and (2) rapid manufacturing, making final parts and products.[28]

---

22. Miller, *supra* note 20; Maureen A. O'Rourke, *Toward a Doctrine of Fair Use in Patent Law*, 100 COLUM. L. REV. 1177, 1177 (2000); Ritchie De Larena, *supra* note 14.

23. O'Rourke, *supra* note 22; Ritchie De Larena, *supra* note 14, at 790. In *Whittemore v. Cutter*, Justice Story expressed that there must be legal protections for those who act "merely for philosophical experiments, or for the purpose of ascertaining the sufficiency of the [patented invention] to produce its described effects." 29 F. Cas. 1120, 1121 (C.C.D. Mass. 1813).

24. Miller, *supra* note 20, at 57; O'Rourke, *supra* note 22; Ritchie De Larena, *supra* note 14, at 790.

25. VICTORIA ZUKAS & JONAS A. ZUKAS, AN INTRODUCTION TO 3D PRINTING 6 (2015).

26. *Id.*; Loz Blain, *HP Launches Metal Jet 3D Printing Technology for Mass Production*, NEW ATLAS (Sept. 13, 2018), https://newatlas.com/hp-metal-jet-3d-printing-production/56315/ [https://perma.cc/E3KC-7P9E]; *How Much Does a 3D Printer Cost?*, 3DINSIDER, https://3dinsider.com/cost-of-3d-printer/ [https://perma.cc/T36Y-WBDB] (last visited Nov. 4, 2018).

27. GEBHARDT & HÖTTER, *supra* note 7, at 4; Hasiuk, *supra* note 9.

28. GEBHARDT & HÖTTER, *supra* note 7, at 2; Hasiuk, *supra* note 9.

Although the use of additive manufacturing offers certain advantages, including "simplification of product innovation, price premiums achieved through customization," and easily reconfigured components, the majority of manufacturers have been slow adopters of 3D printing technology.[29] Additive manufacturing comprises less than 2% of the manufacturing market.[30] Slow-adoption of additive manufacturing is due in part to the high price of 3D printing when compared to the lower cost of traditional manufacturing.[31] However, industry commentators argue that the "threshold" has been crossed and that factories will soon begin adopting additive manufacturing on a grander scale.[32] This expected growth in adoption rates is largely due to a new generation of high-end machines from HP and Carbon.[33]

C. *Maker Movement Bringing 3D Printing into Education*

The Maker Movement's community, which focuses on a person's ability to create things—or be a "maker"—is comprised of individuals from all backgrounds, such as "tech enthusiasts, engineers, educators, amateurs[,] and students of all ages."[34] Makers create all sorts of functional devices, including technological gadgets, home goods, and custom-engraved jewelry.[35] The origins of the

---

29. *See* Murr, *supra* note 7, at 994; Schniederjans, *supra* note 8, at 294; Yeh & Chen, *supra* note 8.

30. Yeh & Chen, *supra* note 8. Although a survey by Allied Market Research found that, in 2013, the global additive manufacturing market was valued at $2.3 billion and was expected to grow to $8.6 billion by 2020. *Id.*

31. *Id.* Several factors could be the cause of the slow adoption rate of additive manufacturing, including antiquated technical infrastructures, external forces, and supply chain issues. *Id.* at 210–11. Other, more specific factors include: the financial costs of upfront capital expenditures to purchase the technology required to implement mass-additive manufacturing, the lack of skilled laborers specialized in additive manufacturing, and concerns over future certification and regulations for additive manufacturing. Jesse Coors-Blankenship, *Challenges Associated with Additive Manufacturing*, FORBES (Mar. 28, 2018, 8:00 AM), https://www.forbes.com/sites/forbestechcouncil/2018/03/28/challenges-associated-with-additive-manufacturing/#5ae4f4f46db0 [https://perma.cc/A2EU-5XFF].

32. Pletz, *supra* note 8.

33. Blain, *supra* note 26; Pletz, *supra* note 8.

34. Sofia Papavlasopoulou, Michail Giannakos & Letizia Jaccheri, *Empirical Studies on the Maker Movement, a Promising Approach to Learning: A Literature Review*, 18 ENT. COMPUTING 57, 59 (2017); Bajarin, *supra* note 16; Covadonga Fernández, *The Origins of the Maker Movement*, BBVA OPENMIND (May 22, 2015), https://www.bbvaopenmind.com/en/the-origins-of-the-maker-movement/ [https://perma.cc/9XXC-DJWL]; Schawbel, *supra* note 16.

35. Papavlasopoulou, Giannakos & Jaccheri, *supra* note 34, at 57; Bajarin, *supra* note 16; Brit

Maker Movement stem from Dale Dougherty's launching of *Make* magazine in 2005.[36] *Make* magazine's opening column, written by Dougherty, explained, "More than mere consumers of technology, we are makers, adapting technology to our needs and integrating it into our lives. Some of us are born makers and others, like me, become makers almost without realizing it."[37] Chris Anderson has further noted the following about the Maker Movement:

> The real revolution here is not in the creation of the technology, but the democratization of the technology. It's when you basically give it to a huge expanded group of people who come up with new applications, and you harness the ideas and the creativity and the energy of everybody. That's what really makes a revolution.
> . . . What we're seeing here with the third industrial revolution is the combination of the two [technology and

---

Morin, *What Is the Maker Movement and Why Should You Care?*, HUFFINGTON POST (May 2, 2013, 12:45 PM), https://www.huffingtonpost.com/brit-morin/what-is-the-maker-movemen_b_3201977.html [https://perma.cc/N2UJ-DN2U].

36. Fernández, *supra* note 34.

37. Harry McCracken, *Maker Faire Founder Dale Dougherty on the Past, Present, and Online Future of the Maker Movement*, FAST COMPANY (Apr. 29, 2015), https://www.fastcompany.com/3045505/maker-faire-founder-dale-dougherty-on-the-past-present-and-online-future-of-the-maker-moveme [https://perma.cc/6Y8C-PYT7]. Dale Dougherty has written extensively on the foundations of the Maker Movement, including the following excerpt:

> Yet the origin of the Maker Movement is found in something quite personal: what I might call "experimental play." When I started Make magazine, I recognized that makers were enthusiasts who played with technology to learn about it. A new technology presented an invitation to play, and makers regard this kind of play as highly satisfying. Makers give it a try; they take things apart; and they try to do things that even the manufacturer did not think of doing. Whether it is figuring out what you can do with a 3D printer or an autonomous drone aircraft, makers are exploring what these things can do and they are learning as well. Out of that process emerge new ideas, which may lead to real-world applications or new business ventures. Making is a source of innovation. While technology has been the spark of the Maker Movement, it has also become a social movement that includes all kinds of making and all kinds of makers, connecting to the past as well as changing how we look at the future. Indeed, the Maker Movement seems to be a renewal of some deeply held cultural values, a recognition rooted in our history and culture that making comes to define us. As Frank Bidart has written in his poem "Advice to the Players": "We are creatures who need to make."

Dale Dougherty, *The Maker Mindset*, *in* DESIGN, MAKE, PLAY: GROWING THE NEXT GENERATION OF STEM INNOVATORS 7 (Margaret Honey & David E. Kanter eds., 2013).

> manufacturing]. It's the computer meets manufacturing, and it's at everybody's desktop.[38]

Because of the rising interest in developing STEM education in schools, many schools and collegiate institutions nationwide and worldwide have adopted aspects of the Maker Movement into their curriculum.[39] Moreover, makerspaces are now built in libraries and museums.[40] In 2016, there were 556 makerspaces in Europe, 483 in North America, and 354 in the rest of the world.[41] The most frequently used "maker" tool in library and university makerspaces is the 3D printer.[42]

II. Analysis

Numerous legal scholars have proposed the development of a fair use exception in patent law; however, this Note focuses on the narrower need for an educational fair use exception.[43] Because the laws of copyrights and patents have been intertwined since their

---

38. Colleen Taylor, *Wired's Chris Anderson: Today's 'Maker Movement' Is the New Industrial Revolution*, TECHCRUNCH (Oct. 9, 2012, 10:19 PM), https://techcrunch.com/2012/10/09/wireds-chris-anderson-todays-maker-movement-is-the-new-industrial-revolution-tctv/ [https://perma.cc/JQE3-VY2J]. In 2006, the Maker Movement continued growing as Dougherty founded the Maker Faire as "[p]art science fair, part county fair, and part something entirely new." Dougherty, *supra* note 16; Fernández, *supra* note 34; McCracken, *supra* note 37; *Maker Faire: A Bit of History*, MAKE: MAKER FAIRE, https://makerfaire.com/makerfairehistory/ [https://perma.cc/WL4J-BQ6Q] (last visited Nov. 4, 2018). Approximately 200,000 people attended the two flagship Maker Faires in the Bay Area and New York annually, and in 2017 there were over 190 independently produced "Mini Maker Faires" and over thirty larger Featured Maker Faires in cities around the world including Tokyo, Rome, Paris, Shenzhen, Milwaukee, and Detroit. Papavlasopoulou, Giannakos & Jaccheri, *supra* note 34, at 58; Fernández, *supra* note 34; *Maker Faire: A Bit of History*, *supra*.

39. Papavlasopoulou, Giannakos & Jaccheri, *supra* note 34, at 58; Victor Rivero, *The Maker Movement Matures: 3D Printing, Serious Play, and More*, 24 INTERNET@SCHOOLS 5, 5 (2017); Doucette, *supra* note 16; Galvin, *supra* note 16.

40. Morin, *supra* note 35.

41. Nicole Lou & Katie Peek, *By the Numbers: The Rise of the Makerspace*, POPULAR SCI. (Feb. 23, 2016), https://www.popsci.com/rise-makerspace-by-numbers [https://perma.cc/6HSQ-8UG7]. There were 14 times more Makerspaces in 2016 than there were in 2006. *Id.* In 2016, the following states had the most makerspaces: California with 56, New York with 31, Florida with 24, Texas with 20, and Michigan with 17. *Id.* However, in 2016, the states with the most makerspaces per person were North Dakota, Wyoming, New Mexico, Montana, and New Hampshire. *Id.*

42. Papavlasopoulou, Giannakos & Jaccheri, *supra* note 34, at 58.

43. *See generally* Desai & Magliocca, *supra* note 5; Miller, *supra* note 20, at 57; O'Rourke, *supra* note 22; Katherine J. Strandburg, *Patent Fair Use 2.0*, 1 U.C. IRVINE L. REV. 265 (2011).

inception, this analysis first parses through the reasoning for the divergence between the two areas of law when it comes to the existence of a fair use doctrine. Next, the analysis explores the codification of the educational fair use exception in copyright law and then focuses on the fair use rules of photocopying by educators to illuminate the need for fair use for educators using 3D printing. Finally, the analysis discusses the Hatch-Waxman Act.[44]

A. Development of Fair Use in Copyright

The fair use doctrine was an integral part of copyright common law before its codification.[45] In 1976, Congress enacted the first Copyright Act to include a codified fair use defense.[46] Section 107 of the Act was merely "intended to restate the [pre-1976] judicial doctrine of fair use, not to change, narrow, or enlarge it in anyway."[47] Common law fair use existed in part because of the constitutional policy for promoting the progress of science and the arts.[48]

Section 107 of the 1976 Copyright Act states that "the fair use of a copyrighted work, including such use by reproduction in copies . . . for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright."[49] Section 107 does

44. Hatch-Waxman Act, 35 U.S.C. § 271 (2018).

45. 4 NIMMER & NIMMER, *supra* note 4.

46. *Id.*

47. H.R. REP. NO. 94-1476, at 66 (1976).

48. Harper & Row, Publishers, Inc. v. Nation Enters., 471 U.S. 539, 549 (1985) (quoting HORACE G. BELL, THE LAW OF COPYRIGHT AND LITERARY PROPERTY 260 (1944)). The Bell treatise explains:

> [T]he author's consent to a reasonable use of his copyrighted works ha[d] always been implied by the courts as a necessary incident of the constitutional policy of promoting the progress of science and the useful arts, since a prohibition of such use would inhibit subsequent writers from attempting to improve upon prior works and thus . . . frustrate the very ends sought to be attained.

Id.

49. 17 U.S.C. § 107 (2018). Some examples of valid fair use include:

> [Q]uotation of excerpts in a review or criticism for purposes of illustration or comment; quotation of short passages in a scholarly or technical work, for illustration or clarification of the author's observations; use in a parody of some of the content of the work parodied; summary of an address or article, with brief quotations, in a news report; reproduction by a library of a portion of a work to replace part of a damaged copy; reproduction by a teacher or student of a small part of a work to illustrate a lesson; reproduction of a work in legislative or judicial proceedings or reports;

not define "fair use" or provide a rule that automatically decides whether a particular use is "fair."[50] Instead, the statute provides four factors courts must consider when determining whether or not the fair use defense applies in a copyright infringement case:

> (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes; (2) the nature of the copyrighted work; (3) the amount and sustainability of the portion used in relation to the copyrighted work as a whole; and (4) the effect of the use upon the potential market for or value of the copyrighted work.[51]

Neither the statute nor higher court decisions provide further guidance about which factors should be weighted more heavily in fair use considerations or how many of the factors must be met to create a fair use defense.[52] Thus, whether or not there is a fair use defense depends on a case-by-case determination on a "consideration of all the evidence."[53]

Because Congress provided little guidance as to how the four factors enumerated in the statute should be applied, legal discussion and confusion continues to surround fair use in copyright law.[54] Therefore, though the fair use exception provides protection for educators making photocopies for their students, the practical limitation of that protection is unclear, leading to lawsuits against educators by publishers.[55]

> incidental and fortuitous reproduction, in a newsreel or broadcast, of a work located in the scene of an event being reported.

H.R. REP. NO. 94-1476, at 65 (quoting 64 REG. OF COPYRIGHTS ANN. REP. 24 (1961)).

50. 4 NIMMER & NIMMER, *supra* note 4, § 13.05(A).

51. 17 U.S.C. § 107.

52. *Id.*; 4 NIMMER & NIMMER, *supra* note 4, § 13.05(A).

53. 4 NIMMER & NIMMER, *supra* note 4, § 13.05(A).

54. *Id.* As noted in the Nimmer treatise on copyright law: "[A] vast body of scholarship also addresses this arena—indeed, more law review articles are published about fair use than cases actually adjudicating the subject!" *Id.* § 13.05.

55. *See generally* Cambridge Univ. Press v. Patton, 769 F.3d 1232, 1267 (11th Cir. 2014).

B. Difference in Nature Between Copyrights and Patents

Although patents and copyrights have been so historically intertwined to be referred to as "sister bodies of jurisprudence," with copyright law frequently borrowing doctrines from patent law, no broad statutory fair use exception—a staple of copyright law—has been carved out in patent law.[56] Professor Maureen A. O'Rourke noted that one potential reason that patent law does not provide fair use protections is due to the nature of protections that copyrights and patents offer and the differences in the processes to obtain those protections.[57] Title 17 and Title 35 of the United States Code describe those processes and protections for copyrights and patents, respectively.[58]

1. Title 17: Copyrights

The subject matter of copyrights subsists in "original works of authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device."[59] A work of authorship has copyright protection from "the moment it is created and fixed in a tangible form" such "that it is perceptible either directly or with the aid of a machine or device."[60]

Registration of a copyright is voluntary and does not change the copyright protections that are vested at the creation of the work of

---

56. Miller, *supra* note 20, at 57; O'Rourke, *supra* note 22; Ritchie De Larena, *supra* note 14, at 790.

57. O'Rourke, *supra* note 22. Professor O'Rourke, in proposing that there be a fair use patent exception, also proposed that the following factors be considered in showing that there has been a fair use: "(i) the nature of the advance represented by the infringement; (ii) the purpose of the infringing use; (iii) the nature and strength of the market failure that prevents a license from being concluded; (iv) the impact of the use on the patentee's incentives and overall social welfare; and (v) the nature of the patented work." *Id*. at 1205.

58. *See generally* 17 U.S.C. §§ 101–1401 (2018); 35 U.S.C. §§ 100–329 (2018).

59. 17 U.S.C. § 102(a) (2018). "Works of authorship include the following categories: (1) literary works; (2) musical works, including any accompanying words; (3) dramatic works, including any accompanying music; (4) pantomimes and choreographic works; (5) pictorial, graphic, and sculptural works; (6) motion pictures and other audiovisual works; (7) sound recordings; and (8) architectural works." *Id.*

60. *Copyright in General*, COPYRIGHT.GOV, https://www.copyright.gov/help/faq/faq-general.html [https://perma.cc/G3AG-N3FQ] (last visited Nov. 4, 2018).

authorship.[61] The term of protection for a copyrighted work depends on whether or not the work has been published, the work's date of first publication, and whether or not the work has an author or is an "anonymous work, a pseudonymous work, or a work made for hire . . . ."[62] Generally, works of authorship created after January 1, 1978, have copyright protections that last for the lifetime of the author plus seventy years.[63]

2. *Title 35: Patents*

Under Title 35, a person may obtain a patent when they "invent[] or discover[] any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof . . . ," subject to the conditions and requirements of the statute.[64] To get an invention patented, an applicant must show that their invention: (1) is subject matter eligible, (2) is disclosed in an enabling disclosure, and (3) meets the statutory standards of utility, novelty, and non-obviousness.[65] The initial threshold for patent eligibility is a higher standard than the threshold for copyright eligibility.[66] Moreover, the United States Patent and Trademark

---

61. *Id.* Barring statutory exceptions, such as fair use, the owner of a copyright under Title 17 has the exclusive rights to do and to authorize any of the following:

> (1) to reproduce the copyrighted work in copies or phonorecords;
> (2) to prepare derivative works based upon the copyrighted work;
> (3) to distribute copies or phonorecords of the copyrighted work to the public by sale or other transfer of ownership, or by rental, lease, or lending;
> (4) in the case of literary, musical, dramatic, and choreographic works, pantomimes, and motion pictures and other audiovisual works, to perform the copyrighted work publicly;
> (5) in the case of literary, musical, dramatic, and choreographic works, pantomimes, and pictorial, graphic, or sculptural works, including the individual images of a motion picture or other audiovisual work, to display the copyrighted work publicly; and
> (6) in the case of sound recordings, to perform the copyrighted work publicly by means of a digital audio transmission.

17 U.S.C. § 106.

62. 17 U.S.C. § 302(c).

63. *Id.* §§ 302–305; *How Long Does Copyright Protection Last?*, COPYRIGHT.GOV, https://www.copyright.gov/help/faq/faq-duration.html [https://perma.cc/T9C7-TDBK] (last visited Nov. 4, 2018).

64. 35 U.S.C. § 101 (2018).

65. *Id.* §§ 101–104 (2018).

66. Ritchie De Larena, *supra* note 14, at 801.

Office (PTO) is notorious for its backlog of pending patent applications, with wait times of approximately two years.[67]

When an inventor submits their application, a PTO examiner evaluates the application for compliance with the statutory standards and negotiates with the inventor over the correct wording of the patent's claims.[68] The patent's claims "form the metes and bounds of the inventor's property right . . . ."[69] Once the patent is granted—a process that is often expensive and takes a few years—the inventor's property rights:

> [S]hall be for a term beginning on the date on which the patent issues and ending 20 years from the date on which the application for the patent was filed in the United States or, if the application contains a specific reference to an earlier filed application or applications under section 120, 121, 365(c), or 386(c) from the date on which the earliest such application was filed.[70]

3. *Comparing the Processes*

Thus, the process for obtaining a patent is more expensive and takes longer than the process for obtaining a copyright.[71] Moreover, patent terms last for a shorter period than copyright terms. Because patents are harder to establish than copyrights, it is possible that the Legislature has been hesitant to carve out a fair use exception in

67. Vic Lin, *How Long Is the US Patent Application Process (How Much Time Does It Take to Get a Utility Patent)?*, PAT. TRADEMARK BLOG, http://www.patenttrademarkblog.com/how-long-us-utility-patent-application-process/ [https://perma.cc/F4QS-FBPS] (last visited Nov. 5, 2018). As of September 2018, the average total of months from the date of the patent application filing until the date of disposal was 23.8 months. *Data Visualization Center*, USPTO, https://www.uspto.gov/corda/dashboards/patents/main.dashxml?CTNAVID=1004 [https://perma.cc/Z7HZ-792A] (last visited Nov. 5, 2018). As of September 2018, the traditional total pendency including requests for continued examinations is 30.2 months. *Id.*

68. O'Rourke, *supra* note 22, at 1186.

69. *Id.* Patent infringement occurs when, "Except as otherwise provided in this title, whoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States, or imports into the United States any patented invention during the term of the patent therefor, infringes the patent." 35 U.S.C § 271(a) (2018).

70. 35 U.S.C. § 154 (2018).

71. O'Rourke, *supra* note 22, at 1186.

patent law, offering greater protections to the investments made by inventors seeking patents.[72] As Professor O'Rourke further explains:

> The two systems also each employ scope-limiting doctrines to guard against overprotection. A brief review of these devices reveals not only that copyright law is more tolerant of a certain amount of infringement than patent, but also that this tolerance is not simply a logical by-product of copyright's relatively low investment in evaluating whether a work merits protection. Rather, it performs socially useful functions that patent law, even with its substantial upfront investment in making the protection decision, should find it desirable to incorporate.[73]

However, in 1998, the digitization of media forced the Legislature to reexamine copyright law with the passage of the Digital Millennium Copyright Act.[74] Soon, the digitization of things, as described by Professors Deven Desai and Gerard N. Magliocca, will similarly require the Legislature to reexamine patent law.[75]

---

72. *Id.*

73. *Id.* at 1187.

74. Desai & Magliocca, *supra* note 5. As Professors Desai and Magliocca noted:

> Digitization has already disrupted copyright-based industries and laws. As cost barriers fell, individuals engaged with copyrighted work as never before. Business-to-business and business-to-consumer models of industrial copyright faltered and, in some cases, failed. Industries were forced to reorganize, and the foundations of copyright were reexamined.

Id. 1998's Digital Millennium Copyright Act sought to rectify this circumvention as well as respond to novel copyright issues that copyright holders were facing with the growth of digital media, as the distribution of digital content over the Internet was making traditional copyright law obsolete. *Digital Millennium Copyright Act*, AM. LIBR. ASS'N, http://www.ala.org/advocacy/copyright/dmca [https://perma.cc/PLU7-MCYE] (last visited Nov. 4, 2018). The DMCA even criminalizes the circumvention of digital rights management systems for fair use processes, such as backing up purchased files or moving to a different platform, as the court found in *Universal City Studios, Inc. v. Reimerdes*, "[i]f Congress had meant the fair use defense to apply to such actions, it would have said so." 82 F. Supp. 2d 211, 219 (S.D.N.Y. 2000); Kyle Wiens, *Weird Rules Governing What We Download*, HARV. BUS. REV. (Nov. 3, 2015), https://hbr.org/2015/11/the-weird-rules-governing-what-we-download [https://perma.cc/T257-2P7N].

75. Desai & Magliocca, *supra* note 5. Professors Desai and Magliocca concluded:

> 3D printing is the next step in general-purpose computing. Michelangelo said that he made statues by removing the parts of the stone that hid the sculpture, but 3D printing promises to transform manufacturing by applying the opposite idea. Activities that

C. Education Fair Use Exception in Copyright

1. Generally

"Nonprofit educational purposes" is the only fair use purpose expressly included in the first factor listed in the copyright statute.[76] By including educational fair use in the statute, the Legislature reveals the importance with which they regard nonprofit education purposes.[77] The Committee expressed a "need for greater certainty and protection for teachers" and that "[i]n an effort to meet this need, the Committee has not only adopted further amendments to section 107, but has also amended section 504(c) to provide innocent teachers and other non-profit users of copyrighted material with broad insulation against unwarranted liability for infringement."[78] The policy behind the codification of the fair use educational purpose was to allow teachers to use copyrighted selections from literature without facing infringement claims from publishers.[79]

2. Photocopying in Education

Before passing the 1976 Copyright Act, the Legislature "employed the help and advice of a committee of educators and publishers to insure that the legislation was evenhanded and workable."[80] In doing so, the Legislature "devoted considerable attention to working out the proper scope of the fair use defense as applied to copying for educational and classroom purposes."[81] The House Report that

> were once the province of only a few are now in the hands of many. The patent system has been able to require disclosure of how a process works, because the cost to infringe was high. Now, cost structures that once required an inventor to find a deep-pocketed outside backer are gone. The design, manufacture, and distribution of goods is easier, faster, and less expensive than ever before. These tasks can be done at home, in a start-up, or at a large business. Patent law and industries that rely on patents will have to adapt to this new environment or face potential obsolescence.

Id. at 1719.

76. 17 U.S.C. § 107 (2018).
77. *Id. See generally* 4 NIMMER & NIMMER, *supra* note 4.
78. 17 U.S.C. § 107 (explaining the historical notes behind the statute).
79. *Id.*
80. Maddox, *supra* note 6.
81. Cambridge Univ. Press v. Patton, 769 F.3d 1232, 1267 (11th Cir. 2014).

accompanied the Copyright Act endorsed classroom guidelines (created by representatives of the Ad Hoc Committee of Educational Institutions and Organizations on Copyright Law Revision, the Authors League of America, Inc., and the Association of American Publishers, Inc.) as "a reasonable interpretation of the minimum standards of fair use."[82]

The classroom guidelines, although offering some assistance to teachers using photocopiers for their classrooms, are flawed. For instance, as noted by the Eleventh Circuit in the 2014 case *Cambridge University Press v. Patton*, although the Legislature endorsed the classroom guidelines, they hold no force of law.[83] Moreover, the classroom guidelines do not differentiate between fair use needs at different educational levels. Indeed, neither the American Association of University Professors nor the Association of American Law Schools would endorse the classroom guidelines because they were too restrictive for the university and graduate level.[84]

---

82. H.R. REP. NO. 94-1476, at 72 (1976). The endorsed guidelines are divided into two different types of photocopying—(1) single copying for teachers and (2) multiple copies for classroom use. The guidelines for single copying for teachers provide that:

> A single copy may be made of any of the following by or for a teacher at his or her individual request for his or her scholarly research or use in teaching or preparation to teach a class: A. A chapter from a book; B. An article from a periodical or newspaper; C. A short story, short essay or short poem, whether or not from a collective work; D. A chart, graph, diagram, drawing, cartoon[,] or picture from a book, periodical, or newspaper[.]

Id. at 68. The guidelines for multiple copies for classroom use provide that:

> Multiple copies (not to exceed in any event more than one copy per pupil in a course) may be made by or for the teacher giving the course for classroom use or discussion; *provided that*: A. The copying meets the tests of brevity and spontaneity as defined below; *and*, B. Meets the cumulative effect test as defined below; *and*, C. Each copy includes a notice of copyright.

Id. The guidelines then go on to define brevity, spontaneity, and cumulative effect. *Id.* at 68–69. Finally, the guidelines offered limitations to educational fair use that are prohibited. *Id.* at 69.

83. *Cambridge Univ. Press*, 769 F.3d at 1273. The *Cambridge Univ. Press* opinion explained:

> We note that the Classroom Guidelines, although part of the legislative history of the Copyright Act, do not carry force of law. In any case, to treat the Classroom Guidelines as indicative of what is allowable would be to create the type of "hard evidentiary presumption" that the Supreme Court has cautioned against, because fair use must operate as a "sensitive balancing of interests."

Id. (quoting Campbell v. Acuff-Rose Music, Inc. 510 U.S. 569, 584 (1994)).

84. H.R. REP. NO. 94-1476, at 72. The guidelines were not supported, however, by representatives of the American Association of University Professors and the Association of American Law Schools who

D. Narrow Statutory Exception in Patent Law

In 1984, the Legislature passed the Hatch-Waxman Act, a codified version of the experimental use exception for the pharmaceutical industry that provides that it is not "an act of [patent] infringement to . . . use . . . a patented invention . . . solely for uses reasonably related to the development and submission of information under a Federal law which regulates the . . . use . . . of drugs . . . ."[85] The Hatch-Waxman Act is not technically a codification of a fair use exception in patent law.[86] However, it functions much in the same way as fair use in copyright law by providing a "safe harbor" to scientists who would technically be infringing upon patents in their research.[87] However, the Hatch-Waxman Act differs from copyright fair use by providing more concrete guidelines and restrictions.[88]

---

felt that the guidelines were "too restrictive with respect to classroom situations at the university and graduate level." *Id.*

85. 35 U.S.C. § 271(e)(1) (2018); Elizabeth A. Rowe, *The Experimental Use Exception to Patent Infringement: Do Universities Deserve Special Treatment?*, 57 HASTINGS L.J. 921, 932 (2006); Eric Guttag, *Carve Outs: Into the Belly of the Hatch-Waxman Beast Part 2*, IPWATCHDOG (Apr. 11, 2013), http://www.ipwatchdog.com/2013/04/11/carve-outs-into-the-belly-of-the-hatch-waxman-beast-part-2/id=38886/ [https://perma.cc/F9GK-LFG4]. The statute codifies that:

> It shall not be an act of infringement to make, use, offer to sell, or sell within the United States or import into the United States a patented invention (other than a new animal drug or veterinary biological product (as those terms are used in the Federal Food, Drug, and Cosmetic Act and the Act of March 4, 1913) which is primarily manufactured using recombinant DNA, recombinant RNA, hybridoma technology, or other processes involving site specific genetic manipulation techniques) solely for uses reasonably related to the development and submission of information under a Federal law which regulates the manufacture, use, or sale of drugs or veterinary biological products.

35 U.S.C. § 271(e)(1).

86. Rowe, *supra* note 85.

87. *Id.*

88. *Id.* As Professor Elizabeth A. Rowe explained:

> The Act provides a safe harbor, permitting drug manufacturers to perform experiments needed to obtain FDA approval of their drugs, even if those experiments are conducted during the patent life of a patented drug being tested—an otherwise infringing use. In addition, the Act lengthens the patent term for drugs requiring FDA approval before entering the market. It also exempts certain activities that would otherwise amount to infringement.

Id.

III. Proposal

The establishment of a statutory fair use defense in patent law need not be as broad as it is in copyright law.[89] Unlike copyrighted songs or films, it is unlikely a patented invention or discovery (such as a medical prosthetic) would become the subject of parody.[90] Furthermore, the policies for extensive copyright protection, which are offered for purposes such as criticism, comment, news reporting, scholarship, or research, are not all necessary to protect the policy interests of STEM education and 3D printing.[91]

Accordingly, the establishment of a broad fair use exception in patent law is unnecessary to protect the interests of educators utilizing additive manufacturing in their classrooms. Therefore, this proposal focuses on an educational fair use exception. This Note provides three distinct proposals, with the first proposal considering an educational patent fair use exception to be modeled after the current copyright fair use exception, the second proposal considering an adapted copyright fair use model that codifies limitations, and the final proposal suggesting that the Legislature use the method it used in adopting the Hatch-Waxman Act.

89. 17 U.S.C. § 107 (2018). Fair use in copyright law may be used as a defense "for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research . . . ." *Id.*

90. 4 NIMMER & NIMMER, *supra* note 4; *see* Brownmark Films, LLC v. Comedy Partners, 800 F. Supp. 2d 991, 1000 (E.D. Wis. 2011) (finding a fair use parody when a South Park episode had a nine-year-old character dressed as a teddy bear singing the song "What What (In the Butt)"), *aff'd*, 682 F.3d 687 (7th Cir. 2012).

91. However, legal scholars have made arguments for other fair use exceptions in patent law. Desai & Magliocca, *supra* note 5 (proposing that at-home 3D printer users should have some protections for patent infringement liability); Miller, *supra* note 20, at 57 (proposing a technology-specific fair use doctrine in patent law); O'Rourke, *supra* note 22 (arguing for the introduction of a broad fair use exception in patent law); Strandburg, *supra* note 43, at 266 n.7 (expanding upon and concurring with Professor Maureen A. O'Rourke's argument for broad fair use in patent law); Deepa Varadarajan, *Trade Secret Fair Use*, 83 FORDHAM L. REV. 1401, 1401 (2014) (arguing that courts should adopt a multi-factor trade secret fair use analysis). *See generally* Liza S. Vertinsky, *Patents, Partnerships, and the Pre-Competitive Collaboration Myth in Pharmaceutical Innovation*, 48 U.C. DAVIS L. REV. 1509, 1509 (2015) (arguing that a targeted statutory patent fair use in the pharmaceutical industry could drive collaborative innovation that could accelerate cures for Alzheimer's disease).

A. Option A: Model After the Copyright Fair Use Exception

Congress could model an educational patent fair use exception for 3D printing on the already existing educational copyright fair use exception for photocopying.[92] The language of the four factors in the Copyright Act fair use statute could be amended for patent law resulting in: (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes; (2) the nature of the patented work; (3) the amount and sustainability of the portion used in relation to the patented work as a whole; and (4) the effect of the use upon the potential market for or value of the patented work.[93]

Much like the Legislature did in 1974, the Legislature could confer with a committee of educators and patent-holders to draft guidelines, and then the Legislature could endorse those classroom guidelines.[94] Further, the Legislature must ensure that consideration is given to different levels of education. 3D printing in an elementary school science class is not the same as 3D printing in a university-level engineering course.[95] Thus, to promote STEM education in all learning institutions, there should be different guidelines created for each level of education.

However, an option modeled almost exactly after copyright fair use would likely lead to the same issues of ambiguity in educational patent fair use as there are in copyright fair use.[96] If the guidelines are endorsed but not integrated into the statute, they will hold no force of law, as is the case in copyright fair use.[97] Thus, by not providing

---

92. 17 U.S.C. § 107.

93. H.R. REP. NO. 94-1476, at 5 (1976).

94. *See generally* 17 U.S.C. § 107; H.R. REP. NO. 94-1476; Maddox, *supra* note 6.

95. Simon Ford & Tim Minshall, *Invited Review Article: Where and How 3D Printing Is Used in Teaching and Education*, 25 ADDITIVE MANUFACTURING 131, 131 (2019); Meghan Bogardus Cortez, *3 Ways Universities Expand 3D Printing Innovation*, EDTECH MAG. (Jan. 17, 2018), https://edtechmagazine.com/higher/article/2018/01/3-ways-universities-expand-3d-printing-innovation [https://perma.cc/J355-W8SH]; Sarah Saunders, *The Impact of 3D Printing on Education in 2017*, 3DPRINT.COM (Jan. 1, 2018), https://3dprint.com/198898/3d-printing-education-2017/ [https://perma.cc/83EY-EKS2?type=image].

96. 4 NIMMER & NIMMER, *supra* note 4.

97. Cambridge Univ. Press v. Patton, 769 F.3d 1232, 1273 (11th Cir. 2014); 4 NIMMER & NIMMER, *supra* note 4.

clear limitations on 3D printing in education, this option would lead to litigation between educators and patent-holders. Because of fear of potential liability, educators would likely not feel secure in allowing the 3D printing of patented objects in their classrooms, and less advancement in STEM education would occur.

B. Option B: New Factors

Congress could modify the copyright fair use factors in a way that is more applicable to patent fair use, such as the factors proffered by Professor O'Rourke: "(i) the nature of the advance represented by the infringement; (ii) the purpose of the infringing use; (iii) the nature and strength of the market failure that prevents a license from being concluded; (iv) the impact of the use on the patentee's incentives and overall social welfare; and (v) the nature of the patented work."[98] Professor O'Rourke argued that these factors should be applied to a general fair use in patent law; however, these factors could also be applied to the more narrow fair use exception for educational uses of 3D printing.[99]

Then, the Legislature could provide concrete limitations on the fair use of 3D printing of patented objects. To do this, the Legislature should again consult with educators and patent-holders to develop different limitations for primary, secondary, and higher education institutions. The Legislature should codify those limitations, instead of merely endorsing them as guidelines, so that the codified limitations would have the force of law.[100]

The limitations must be clear enough to allow educators to know what is and what is not allowed because *any* type of 3D printing in classrooms should not be allowed for *any* purpose. For instance, students should not be permitted to 3D print a patented object for their own personal use. Moreover, much like there is a limit of one photocopy per student in copyright fair use, there should be a limit on

98. O'Rourke, *supra* note 22, at 1205.
99. *Id.*
100. *Cambridge Univ. Press*, 769 F.3d at 1273.

the amount of patented objects a classroom may print.[101] What happens with the patented objects after they are used as demonstratives for educational purposes? Should the students be allowed to make changes in the design of patented objects and then 3D print the object with those changes? To make these determinations, the Legislature must learn more about how 3D printing is being used in STEM education at all levels.[102]

This option has its own issues. The first issue is that 3D-printing technology is constantly developing, with the technical limits of what can and what cannot be printed becoming narrower with each discovery.[103] Thus, the codified limitations would need to be broad enough to encompass things that cannot currently be printed but are likely to become available soon, such as large-scale metal machines. Otherwise, the limitations would have to be amended as frequently as additive manufacturing technology is updated—an impossible expectation of the Legislature.

C. Option C: Follow Methodology of Hatch-Waxman Act

The third option could be to create a statute that is not officially titled a fair use exception but essentially functions in the same way by acting as a safe-harbor, similar to the Hatch-Waxman Act.[104] This option would likely quell the slippery-slope fears of introducing a

---

101. H.R. REP. NO. 94-1476, at 71 (1976).

102. *See generally* Rachael Elrod, *Tinkering with Teachers: The Case for 3D Printing in the Education Library*, 39 EDUC. LIBR. 1, 1 (2016); Ford & Minshall, *supra* note 95; John Dogru, *The Influence of Education on the 3D Printing Industry*, TECHCRUNCH (Nov. 14, 2015, 11:00 AM), https://techcrunch.com/2015/11/14/the-influence-of-education-on-the-3d-printing-industry/ [https://perma.cc/D5AR-YC9R]; Jeanette McConnell, *10 Ways Teachers Are Enhancing STEM Learning with 3D Printing*, MAKERS EMPIRE, https://www.makersempire.com/top-10-stem-3dprinting-education/ [https://perma.cc/CW5C-YBNG] (last visited Nov. 5, 2018).

103. Patrick Daniels, *20 Things You'll Never Have to Buy Again if You Own a 3D Printer*, DIGITAL TRENDS (Nov. 4, 2018, 6:46 PM), https://www.digitaltrends.com/cool-tech/useful-3d-printed-household-items/ [https://perma.cc/AVB3-9LM5]; Bernard Marr, *7 Amazing Real-World Examples of 3D Printing in 2018*, FORBES (Aug. 22, 2018, 12:57 AM), https://www.forbes.com/sites/bernardmarr/2018/08/22/7-amazing-real-world-examples-of-3d-printing-in-2018/#30dc916585c3 [https://perma.cc/PUM4-KUL5]; Jordan Minor, *The Coolest Things to Ever Be 3D Printed*, GEEK.COM (May 7, 2018, 9:00 AM), https://www.geek.com/tech/the-coolest-things-to-ever-be-3d-printed-1739009/ [https://perma.cc/UPN9-US3Q].

104. 35 U.S.C. § 271(e)(1) (2018).

statute labeled patent fair use.[105] Because there is already a narrow safe-harbor exception in patent law that is similar to copyright law's fair use exception, the precedent could allow for the establishment of another narrow exception—one focusing on permissible 3D printing of patented objects in education. The Hatch-Waxman Act precedent, in conjunction with the narrow need to protect educators using 3D printing, would make Option C the most viable option of those proposed in this Note.

Like the other two options, in order for any safe harbor in patent law for 3D printing to be successful, the Legislature must first make a thoughtful inquiry into the needs of STEM educators. Then, the Legislature could add a clause to 35 U.S.C. § 271 with the same starting language as the experimental use exception for the pharmaceutical industry codified in 35 U.S.C. § 271(e)(1): "It shall not be an act of infringement to . . . ."[106] Finally, the clause should explain the actions that are not infringement.

Rather than utilizing or adapting the four fair use factors, as suggested in Option A and Option B, the safe-harbor clause could, like the Hatch-Waxman Act, be tailored to the needs of fair use in educational uses of additive manufacturing. As discussed in Option B, the clause should provide clear limitations so that teachers can feel secure in using 3D printing in their classrooms.[107] Similarly in Option B, those limitations should also be based on guidance from a committee of educators, from all education levels, and patent-holders.[108]

Fundamentally, Option B and Option C would require the same considerations and have similar shortcomings.[109] The main difference between the two options is essentially the use of the factors suggested by Professor O'Rourke versus the use of the phrase "fair use."[110]

105. Steve Cohen, *What Are the Legal Challenges with Intellectual Property*, ASS'N FOR TALENT DEV. (Jan. 28, 2016), https://www.td.org/insights/what-are-the-legal-challenges-with-intellectual-property [https://perma.cc/A69C-HQ3X].
106. 35 U.S.C. § 271(e)(1).
107. *See* discussion *supra* Section III.B.
108. *See* discussion *supra* Section III.B.
109. *See* discussion *supra* Section III.B.
110. O'Rourke, *supra* note 22.

However, both options provide educators with a way to continue incorporating 3D printing into their curriculum.

CONCLUSION

As additive manufacturing becomes more integral in the commercial sector, the open-sourcing and sharing of 3D-printed files is likely to disappear, with patenting of 3D-printed goods becoming the norm.[111] Globalization is changing the job market, and educators must be able to inspire their students to pursue STEM careers for the United States to have a viable place in future industry.[112] In 1976, the Legislature wanted to protect *traditional* education models; however, the technology used in education is no longer limited to the photocopier.[113]

As the methodology in education continues to change to include the use of new technology, such as the 3D printer, teachers could become liable for patent infringement. Educators concerned about patent infringement would likely stop allowing the use of 3D printers in their learning institutions, thus eliminating a useful tool in STEM education. Because of the policy considerations behind the focus on STEM education, the Legislature should offer patent fair use protection to educators who use 3D printers in their instruction, as the Legislature did in 1976 when it granted fair use protection to educators who used photocopies to teach their students.[114]

First, Congress must evaluate the needs of STEM and learn more about the use of 3D printing in classrooms in primary schools,

---

111. *See* Bhawsar, *supra* note 11; Kerns, *supra* note 11.

112. *Vital Signs United States*, *supra* note 1; *Science, Technology, Engineering and Math: Education for Global Leadership*, *supra* note 2.

113. Zoë Bernard, *Here's How Technology Is Shaping the Future of Education*, BUS. INSIDER (Dec. 27, 2017, 12:31 PM), https://www.businessinsider.com/how-technology-is-shaping-the-future-of-education-2017-12 [https://perma.cc/C9YK-LUJQ]; Anmar Frangoul, *How Technology Is Changing in the Education Sector*, CNBC (May 30, 2018, 1:19 AM), https://www.cnbc.com/2018/05/30/how-technology-is-changing-in-the-education-sector.html [https://perma.cc/CY26-X9B2]; Mike Silagadze, *How Education and Technology Are Evolving Together*, FORBES (May 4, 2018, 1:01 PM), https://www.forbes.com/sites/quora/2018/05/04/how-education-and-technology-are-evolving-together/ [https://perma.cc/6F2S-3H82].

114. H.R. REP. NO. 94-1476, at 68 (1976); 4 NIMMER & NIMMER, *supra* note 4; *Science, Technology, Engineering and Math: Education for Global Leadership*, *supra* note 2.

secondary schools, and post-secondary institutions. This first step must be taken no matter which process Congress decides to take in protecting educators. Then, Congress must decide how to best protect those teachers from future patent infringement issues, whether it be by creating a fair use in patent law for educational purposes or by creating a safe-harbor statute for educators. Finally, Congress should integrate the information about the needs of STEM educators into whichever method it chooses.

At this time, there is still sufficient open-source file sharing available to educators, so Congress may take its time in deciding how to proceed.[115] However, if Congress does nothing to protect the use of 3D printers in education as the importance of additive manufacturing grows and as open-source sharing disappears, the progress of STEM education could be stunted because of patent infringement issues. Therefore, as jobs continue to grow in science, technology, engineering, and math fields, Congress must protect teachers encouraging their students' excitement about STEM learning through 3D printing.[116]

---

115. *See* Fram, *supra* note 5; Bulent Yusuf, *35 Best Sites for Free STL Files & 3D Printer Models of 2018*, ALL3DP (May 19, 2018), https://all3dp.com/1/free-stl-files-3d-printer-models-3d-print-files-stl-download/ [https://perma.cc/4JXY-EYJF]. The article lists thirty-five websites where people can download free 3D printer models including Thingiverse, CGTrader, and MyMiniFactory. Yusuf, *supra*. The following websites have free files: 3D Warehouse with 4,000,000 free files, GrabCAD with 2,840,000 free files, and STL Finder with 2,000,000 free files. Martin Lansard, *The Best Sites to Download Free STL Files, 3D Models and 3DpPrintable Files for 3D Printing*, ANIWAA (Oct. 25, 2018), https://www.aniwaa.com/best-sites-download-free-stl-files-3d-models-and-3d-printable-files-3d-printing/ [https://perma.cc/NM4Y-HK5P].

116. Elrod, *supra* note 102; Dogru, *supra* note 102; McConnell, *supra* note 102.