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Patricia E. Campbell

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UNIVERSITY CLASSROOM PRESENTATIONS AS PRIOR ART DISCLOSURES: ARE ENGINEERING CAPSTONE TEAMS UNKNOWINGLY GIVING AWAY THE FRUITS OF THEIR LABOR?

Patricia E. Campbell*

Today's universities and colleges offer a multitude of programs focused on innovation, product development, and entrepreneurship.[1] *Students and faculty members are encouraged to create products that can be commercialized.*[2] *Universities nurture innovation and entrepreneurship in order to foster economic growth and create jobs in their communities and regions.*[3] *They see entrepreneurship as a new career path for students interested in starting their own companies rather than pursuing traditional employment opportunities.*[4] *Universities may also view entrepreneurship and innovation as key components in attracting outside funding and support for research from industry collaborators and government sources.*[5] *Colleges and universities now offer majors and minors in entrepreneurship, experiential*

*Patricia Campbell is a Law School Professor at the University of Maryland Francis King Carey School of Law, where she serves as Director of the Intellectual Property Law Program and Director of the Maryland Intellectual Property Legal Resource Center (MIPLRC). Professor Campbell also holds a joint appointment as an Associate Professor in the Maryland Technology Enterprise Institute (Mtech), a division of the A. James Clark School of Engineering, University of Maryland at College Park.

[1] Office of Innovation and Entrepreneurship at the Economic Development Administration, *The Innovative and Entrepreneurial University: Higher Education, Innovation and Entrepreneurship in Focus,* U.S. DEPT. OF COM. at 9–13 (2013), http://www.eda.gov/pdf/The_Innovative_and_Entrepreneurial_University_Report.pdf.

[2] *Id.*

[3] *Id.*

[4] *Id.* at 9.

[5] *Id.* at 12–13

learning opportunities, business plan competitions, incubators and accelerators, entrepreneurship-focused residence halls, and various other programs intended to train entrepreneurs and support startups.[6]

Engineering schools and departments have taken a leading role in the entrepreneurship movement, and courses increasingly focus on innovation and commercialization of new products. Every accredited engineering program must require its undergraduate students to participate in a capstone course where the student identifies a problem, devises a solution to that problem, and builds an operational prototype that can be tested and verified.[7] *Students are encouraged or even expected to create novel inventions that may be entitled to patent protection.*[8] *However, rather than training students to protect rights in intellectual property they have created, many universities appear to be blind or indifferent to the risks posed by the structure of their capstone courses. In order to receive a grade for the course and graduate with an engineering degree, students are instead required to continually share their inventive process and resulting innovations with their fellow students, with faculty mentors and other advisors, and ultimately with the public.*[9]

This article evaluates whether these practices may constitute novelty-defeating prior art disclosures that could result in a student losing his or her right to obtain a patent in the United States.[10] *Specifically, this article asks whether students'*

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[6] *Id.* at 19–22. The report, released in October 2013, indicates that at least 450 colleges and universities across the U.S. have entrepreneurship programs.

[7] *Criteria for Accrediting Engineering Programs*, ACCREDITATION BOARD FOR ENGINEERING AND TECH. 1, 4 (2014), http://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2015-2016/#curriculum; *see also* Ashraf Saad, *Senior Capstone Design Experiences for ABET Accredited Undergraduate Electrical and Computer Engineering Education* 1 (2007), http://show.docjava.com/courses/abetPapers/04147435.pdf.

[8] *See* Saad, *supra* note 7, at 295.

[9] Saad, *supra* note 7, at 295-296.

[10] As noted above, universities now offer a multitude of entrepreneurship programs. Entrepreneurship has become a significant focus in many academic

presentations are putting their inventions in "public use," whether their reports and posters constitute "printed publications," and whether the inventions are "otherwise available to the public." Part I of this article provides background information on the structure of capstone programs offered by accredited engineering schools. Part II reviews the laws relating to public use and printed publications, and it examines whether student presentations and written reports could potentially constitute public uses and/or printed publications for purposes of patent law. It also considers whether these activities risk making students' inventions "otherwise available to the public," arguably a new category of prior art created by the America Invents Act. Part III considers whether it would be theoretically inconsistent with the policies underlying the patent laws to treat student inventions, created and discussed within the confines of a university classroom, as novelty-defeating prior art disclosures. Part III also provides recommendations for ways that universities may be able to restructure the engineering capstones in order to better protect the rights of their students, including cross-campus collaborations with law schools that can provide basic education about intellectual property rights and may even be able to assist engineering students with obtaining patent protection.

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disciplines, including business, arts and sciences, and professional schools, as well as engineering. This article is limited in scope to engineering capstone courses, but many of its observations and recommendations may have application to other programs where students are expected to create and commercialize new products and services.

I. BACKGROUND ON ENGINEERING CAPSTONE PROGRAMS

In order to receive accreditation, every undergraduate engineering program in the United States must require its students to participate in a capstone design course.[11] The Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. ("ABET") requires that "[s]tudents must be prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints."[12]

Engineering schools have a great deal of latitude in designing their capstone courses. The traditional goal of the capstone was to simulate the experience that most engineers would encounter when they became employed in industry after graduation.[13] In the last

[11] *Criteria for Accrediting Engineering Programs*, *supra* note 7.
[12] *Id.*
[13] Saad, *supra* note 7, at 294–99; *see also* Robert. Hauhart & Jon Grahe, DESIGNING AND TEACHING UNDERGRADUATE CAPSTONE COURSES 16 (Maryellen Weimer, ed., Jossey-Bass 2015) (stating that the purpose of all

few years, however, many capstone courses have been transformed into entrepreneurial training programs that encourage students to create innovative products that might later form the basis for a startup company. Capstone students confront real-world challenges in a supportive educational environment. Students typically work in teams with three to six members, and the course instructor serves as a team advisor. Industry mentors may also be incorporated into the course to provide additional guidance and technical direction for the teams and to better simulate a realistic industry environment.[14]

During the semester or year-long capstone, students are expected to provide weekly presentations to their classmates and advisors.[15] In the early stages of the course, the presentations focus on the team's selection of its projects.[16] Team members describe the problem they are attempting to solve and identify less satisfactory solutions that have been proposed in the past.[17] The students may also be asked to evaluate the potential marketability

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capstone courses from the late eighteenth century to today is to "integrate concepts across learning experience.").

[14] *See* Saad, *supra* note 7, at 295.

[15] HARVEY F. HOFFMAN, THE ENG'G CAPSTONE COURSE: FUNDAMENTALS FOR STUDENTS AND INSTRUCTORS 54 (Springer Int'l Publishing 2014); *see also* FREDERICK BLOETSCHER & DANIEL MEEROFF, PRACTICAL CONCEPTS FOR CAPSTONE DESIGN ENGINEERING (J. Ross Publishing, Inc. 2015).

[16] Some schools take a different approach. Rather than expecting the students to identify a problem needing a solution, some schools instead seek outside proposals from corporate sponsors and individuals. If chosen, the sponsors may be asked to work with the capstone team on a regular basis and fund the direct costs of the project. When schools rely on outside sponsorship, it is often unclear whether any resulting intellectual property is owned by the students or whether it vests with the university or outside sponsor. Universities are struggling to develop an appropriate approach to this problem. *See, e.g.*, *School of Informatics, Computing, and Cyber Systems*, NORTHERN ARIZ. UNIV., https://nau.edu/cefns/engineering/electrical/capstone-projects/ (last visited Dec. 14, 2015); *Senior Capstone Design*, MICH. TECH. UNIV., http://www.mtu.edu/mechanical/undergraduate/senior-design/ (last visited Dec. 14, 2015); *Senior Design Capstone Experience*, UNIV. OF N. TEXAS COLLEGE OF ENG'G, http://engineering.unt.edu/capstone (last visited Dec. 14, 2015).

[17] HOFFMAN, *supra* note 15.

of their proposed solution and to discuss other financial considerations involved in the project.[18]

As their work progresses, the team may be required to provide formal technical reviews.[19] This may include a written proposal setting forth their design requirements and specifications, technical drawings, and a description of test methodologies that will be used to determine if the new product successfully meets its stated goals.[20] The team members will also give oral presentations discussing the technical and other attributes of the product being designed, which may be accompanied by PowerPoint presentations illustrating the details of the invention.[21]

Upon completion of the project, the team submits a final report containing a detailed description of the technical aspects of their device, including how the device is made, how it works, and how it will be used.[22] The final report typically includes drawings and photographs of the product, test results showing that it meets its intended purpose, and a discussion of marketability issues.[23] The team will also give a final oral presentation to classmates and mentors.[24] The final presentation may include a demonstration of a working model of the invention and may be accompanied by a slide presentation highlighting the novel features of the new

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[18] *Id.*

[19] *Id.* at 65–75.

[20] *Id.*

[21] *Id.* at 72–75.

[22] Saad, *supra* note 7, at 296; Richard C. Fries, *An Industry Perspective on Senior Biomedical Engineering Design Courses*, IEEE ENGINEERING IN MED. AND BIOLOGY MAG., July–Aug. 2003, at 111; Jay Goldberg, *Senior Design: Let's Talk About Senior Design Courses*, IEEE ENGINEERING IN MED. AND BIOLOGY MAG., Mar.–Apr. 2003, at 17; Brian S. Kunst & Jay R. Goldberg, *Standards Education In Senior Design Courses*, IEEE ENGINEERING IN MED. AND BIOLOGY MAG., July-Aug. 2003, at 114; *See also,* Mark Somerville, et al., *The Olin Curriculum: Thinking Toward the Future*, IEEE TRANSACTIONS IN EDUC., Feb. 2005, at 198.

[23] HOFFMAN, *supra* note 15, at 83–85.

[24] *Id.* at 85–86.

product, technical details of its construction, and an overview of test data verifying that the product performs its intended purpose.[25]

The capstone course frequently culminates in a public event showcasing the work of the capstone teams.[26] The teams may provide working demonstrations of the new products, and they may also display posters describing technical details of the design and test data relating to its functionality. In some instances, more formal oral presentations may be provided. The event may be open to the campus community, members of industry and interested investors, or to the general public.[27] Attendees may even have an opportunity to vote for their favorite projects, and prizes may be awarded for outstanding designs.[28] In addition, many schools have developed websites to highlight their capstone programs to prospective students, employers, and sponsors.[29]

The requirements of the capstone courses themselves, coupled with universities' efforts to publicize the work carried out by their

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[25] *Id.* at 86.

[26] *See, e.g.*, *Capstone Design*, GA. TECH., http://www.capstone.gatech.edu/ (last visited Oct. 29, 2016) ("At the end of the semester, student teams display and pitch their inventions and marketability to a panel of judges, invited guests, media, and their peers, while competing for cash prizes. This is an excellent opportunity for sponsors to see how their project was conceptualized by the teams at the expo."); *Ohio State Capstone Design Showcase*, OHIO STATE UNIV. COLL. OF ENG'G., https://eeic.osu.edu/capstone-design-showcase-0 (last visited Oct. 29, 2016) (containing numerous photos on website showing detailed posters about the capstone projects and stating that individual students and student teams present their projects and selected findings to a team of judges comprised of industry and faculty members); *Senior Design*, SANTA CLARA UNIV. SCH. OF ENG'G, https://www.scu.edu/engineering/undergraduate/senior-design/ (last visited Dec. 14, 2015) (stating how students present their capstone projects to a panel of alumni and industry judges).

[27] *See, e.g.*, *Mechanical Engineering Design Day at the University of Maryland*, UNIV. OF MD., http://www.enme.umd.edu/events/me-design-day (last visited Oct. 29, 2016).

[28] *Id.*

[29] *See, e.g.*, *College of Engineering Capstone Program*, IOWA ST U. C. OF ENGINEERING, http://www.engineering.iastate.edu/capstone/ (last visited Oct. 29, 2016) (illustrating how school has created websites for several departments' capstone projects); *Capstone*, BYU, http://capstone.byu.edu/ (last visited Dec. 14, 2015).

capstone teams, raise serious concerns that student inventors are forfeiting potentially valuable intellectual property rights. The Patent Act now provides that a person shall be entitled to a patent unless "the claimed invention was patented, described in a printed publication, in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention."[30] The act makes an exception for disclosures by the inventor made less than one year before the effective filing date of the patent application.[31] As a result, the America Invents Act greatly expanded the scope of prior art by eliminating all geographic distinctions, such that disclosures made anywhere in the world now qualify as prior art (subject to the one-year "grace period").[32] However, much of the rest of the world maintains a strict novelty standard, and any disclosure of an invention immediately results in loss of right to file a patent application.[33]

The question then is whether student activities carried out as part of a capstone course could be construed as invalidating prior

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[30] 35 U.S.C. § 102(a) (2012). Prior to the amendments effected by the America Invents Act, an inventor could lose his/her right to obtain a patent if "the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States." 35 U.S.C. § 102(b) (repealed 2013). A date one year before the effective filing date of the patent application is referred to as the "critical date."

[31] 35 U.S.C. § 102(b)(1) (2012). The Act provides,

> [a] disclosure made 1 year or less before the effective filing date of a claimed invention shall not be prior art to the claimed invention under subsection (a)(1) if –
>
> (A) the disclosure was made by the inventor or joint inventor or by another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor; or
>
> (B) the subject matter disclosed had, before such disclosure, been publicly disclosed by the inventor or a joint inventor or another who obtained the subject matter disclosed directly or indirectly from the inventor or a joint inventor.

[32] *Id.*

[33] *See, e.g.*, European Patent Convention art. 54(2), Nov. 29, 2000 (stating that prior art includes "everything made available to the public by means of a written or oral description, by use, or in any other way.").

art disclosures under U.S. patent law. It may be reasonably apparent when an invention has already been patented by the inventors themselves or by a third party, as well as when the invention has already been placed on sale by the student inventors or by someone else.[34] The more troubling questions are whether student presentations, demonstrations, and written reports can be viewed as public uses of the invention, whether they constitute printed publications, and/or whether they make student inventions "otherwise available to the public."[35]

By way of example, imagine a biomedical engineering capstone course where student teams were tasked with designing new or improved medical devices. Emily, a student in the class, was particularly interested in laparoscopic surgical instruments, and she asked three other students in the capstone to join her team. The team members conducted extensive research about laparoscopic surgical instruments and techniques, including an examination of the scholarly literature in medical journals and textbooks and a preliminary review of issued U.S. patents. They learned that laparoscopic surgery (such as gall bladder removal, appendectomy, and hernia repair) is performed by making multiple small incisions ("ports") in a patient's abdomen through which surgical instruments and scopes are then inserted. However, the rigid nature of the instruments can make them difficult to manipulate in the narrow ports, leading to larger and/or an increased number of incisions and imprecise placement of cuts and staples. The team quickly concluded that there was a need for flexible instruments that can be more easily controlled by the surgeon during laparoscopic procedures, and they presented their findings and conclusions to the capstone class.

The capstone instructor encouraged Emily's team to meet with Dr. Benjamin, a surgeon at the university's School of Medicine. Dr. Benjamin told the team about his experiences with

[34] *See* Pfaff v. Wells Elecs., Inc., 525 U.S. 55, 67 (1998). The on-sale bar applies when two conditions are met before the critical date: (1) "the product must be the subject of a commercial offer for sale," and (2) "the invention must be ready for patenting." *Id*.

[35] 35 U.S.C. § 102(a)(1) (2013).

laparoscopic surgical instruments, and he agreed to serve as an informal mentor to the group; however, he did not sign a nondisclosure agreement or other agreement. Armed with this new knowledge, the team began designing laparoscopic surgical scissors with an articulated joint behind the cutting mechanism. The position of the cutting mechanism was to be controlled by a knob mounted on the instrument handle. The knob is connected to and remotely manipulates the articulated joint by a thin rod running along the longitudinal axis of the instrument, thereby allowing a surgeon to make more precise cuts. The team shared their design with the capstone class, and another student suggested that they confer with a mechanical engineering professor to better refine the connection between the knob and the articulated joint. The team then discussed their design with Professor John in the Department of Mechanical Engineering, after which they finalized their technical drawings. Subsequently, the team prepared an interim technical review for the capstone course, including a written report discussing the literature and patent review and describing the problem they were attempting to solve, their proposed solution, and the final technical drawings. The written report was submitted only to the course instructor and the team's mentors, Dr. Benjamin and Professor John, but the team also prepared slides (including technical drawings) and gave a lengthy in-class presentation.

Next, the team developed and tested a physical prototype of their device while continuing to provide weekly reports to the capstone class and periodic updates to Dr. Benjamin. First, they visited the university's fabrication lab and worked with the lab director to produce a plastic prototype on a 3D printer. They then tested the plastic prototype in pillows and sheets of dense foam since they did not have access to live animals or human subjects. Finally, the university's machine shop agreed to produce a stainless steel prototype of the surgical scissors. The team prepared a final written report containing a detailed written description of the scissors, including drawings and photographs, and the results of their testing, which they again submitted to the course instructor and their mentors, Dr. Benjamin and Professor John. In addition, they made a final oral presentation to the capstone class where they

demonstrated the working model of the scissors, discussed its technical attributes, and explained why they believed they designed a novel surgical instrument that had great promise in the field of laparoscopic surgery. The presentation was attended by other faculty members from the engineering school and two venture capitalists from the community. At the end of the course, the team participated in the school's Capstone Day, where they demonstrated their surgical scissors to members of the public and presented a poster showing drawings of the device and touting its technical attributes.

Several months after graduation, Emily reconnected with the members of her team to discuss the possibility of forming a startup company focused on developing specialized surgical instruments, including the laparoscopic surgical scissors. After speaking with a patent attorney, the team had serious concerns about its ability to obtain a patent on the surgical scissors. Specifically, the attorney questioned the confidentiality of their written reports and weekly oral presentations to the class, their discussions with Dr. Benjamin and Professor John, their work with the university's fabrication lab and machine shop, the final presentation to the class that was attended by other engineering faculty members and venture capitalists, and their activities at Capstone Day. Did Emily's team unknowingly give away the fruits of their labor and lose any right they may have had to obtain a patent on their laparoscopic surgical scissors?

II. PUBLIC USE, PUBLICATIONS, AND INVENTIONS THAT ARE "OTHERWISE AVAILABLE TO THE PUBLIC"

Courts have historically implemented a relatively strict interpretation of the laws relating to public use and publication of inventions. Novelty-defeating public uses and publications have been found even when the subject invention was disclosed to only a small number of individuals. Whether an invention is "otherwise available to the public" has been described as a new category of prior art, and it remains unclear what factors a court may consider

in determining precisely when an invention becomes available to the public.[36]

A. Public Use

The public use bar applies when two conditions are met. The invention must be in public use, which is demonstrated by showing either that the purported use was (1) accessible to the public or (2) commercially exploited. In addition, the invention must be ready for patenting, which can be demonstrated by showing that (1) the invention was reduced to practice or (2) the inventor had prepared drawings or other descriptions of the invention that were sufficiently specific to enable a person skilled in the art to practice the invention before the critical date.[37]

A "public use" is generally described as "any use of [the claimed] invention by a person other than the inventor who is under no limitation, restriction, or obligation of secrecy to the inventor."[38] In determining whether a particular use was a public use, a court will consider the "totality of the circumstances in conjunction with the policies underlying the public use bar."[39] Those policies include:

> (1) discouraging the removal, from the public domain, of inventions that the public reasonably has come to believe are freely available; (2) favoring the prompt and widespread disclosure of inventions; (3) allowing the inventor a reasonable amount of time following sales activity to determine the potential economic value of a

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[36] *See infra* pp. 213–17.

[37] Mass. Inst. of Tech. v. Harman Int'l. Indus., Inc., 584 F. Supp. 2d 297, 309 (D. Mass. 2008) (citing Invitrogen Corp. v. Biocrest Mfg., L.P., 424 F.3d 1374, 1379–80 (Fed. Cir. 2005)); *see also* Pfaff v. Wells Elecs., Inc., 525 U.S. 55 at 66–67. Under pre-AIA law, the critical date was the date one year prior to the date on which the patent application was filed.

[38] *In re* Smith, 714 F.2d 1127, 1134 (Fed. Cir. 1983) (citing Egbert v. Lippmann, 104 U.S. 333, 336 (1881)).

[39] Baxter Int'l, Inc. v. Cobe Labs., Inc., 88 F.3d 1054, 1058 (Fed. Cir. 1996) (citing Tone Bros. v. Sysco Corp., 28 F.3d 1192, 1198 (Fed. Cir. 1994), *cert. denied,* 514 U.S. 1015 (1995)).

> patent; and (4) prohibiting the inventor from commercially exploiting the invention for a period greater than the statutorily prescribed time.[40]

In evaluating the totality of the circumstances surrounding an allegation of public use, courts have considered a number of factors, including (1) evidence relevant to experimentation, (2) the nature of the activity that occurred in public, (3) public access to the use, (4) confidentiality obligations imposed on members of the public who observed the use, and (5) commercial exploitation.[41] The case law amply demonstrates that "[v]ery little use and very little publicity are required to constitute a public use."[42] Even one use can sometimes be enough.[43]

Merely showing the invention to someone else or demonstrating it to another may sometimes constitute a "public use" of the invention.[44] In *Beachcombers International, Inc. v.*

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[40] Tone Bros., Inc. v. Sysco Corp., 28 F.3d at 1198 (Fed. Cir. 1994) (citing King Instrument Corp. v. Otari Corp., 767 F.2d 853, 860 (Fed. Cir. 1985), *cert. denied,* 475 U.S. 1016 (1986)) (holding that experimentation directed to functional features of a product also containing an ornamental design may negate what would otherwise be considered a public use).

[41] *See* Invitrogen Corp. v. Biocrest Mfg., L.P., 424 F.3d at 1374, 1379–80 (Fed. Cir. 2005); *see also* System Mgmt. Arts Inc. v. Avesta Techs., Inc., 87 F. Supp. 2d 258, 264 (S.D. N.Y. 2000) (listing circumstances that have been deemed material in determining whether invention was in public use); Mass. Inst. of Tech. v. Harman Int'l. Indus., Inc., 584 F. Supp. 2d at 309.

[42] DONALD S. CHISUM, 2–6 CHISUM ON PATENTS [hereinafter CHISUM ON PATENTS]) § 6.02[5] (2015).

[43] Egbert v. Lippmann, 104 U.S. 333, 336 (1882)

> ([W]hether the use of an invention is public or private does not necessarily depend upon the number of persons to whom its use is known. If an inventor, having made his device, gives or sells it to another, to be used by the donee or vendee, without limitation or restriction, or injunction of secrecy, such use is public, even though the use and knowledge of the use may be confined to one person.).

[44] *See* Am. Seating Co. v. USSC Grp., Inc., 514 F.3d 1262, 1267 (Fed. Cir. 2008) ("An invention is in public use if it is *shown to* or used by an individual other than the inventor under no limitation, restriction, or obligation of confidentiality.") (emphasis added).

Wildewood Creative Products, Inc.,[45] the Federal Circuit held that there was sufficient evidence to support a finding of public use where the inventor displayed her invention, an improved liquid kaleidoscope, at a party attended by twenty to thirty guests because she did not retain control over the use of the invention and the future dissemination of information about it. The inventor testified that she demonstrated the kaleidoscope in order to generate discussion and feedback, and she acknowledged that she did not impose any confidentiality obligations upon her guests and made no efforts to keep the device secret.[46] There was also evidence that some of the guests were permitted to pick up the device and look at it. [47] Similarly, in *Martin v. Norman Industries, Inc.,* [48] demonstration of the "Mole II" underwater pipe trenching machine to approximately 100 guests at a crawfish boil was held to be a public use.[49] The machine was suspended over the work yard and its gears were engaged, but it was not placed underwater and did not dig any trenches.[50] Nevertheless, even though the machine was not in its working environment, the demonstration was considered to be a public use.[51]

Courts have been particularly willing to find a public use when the purpose of the demonstration was to draw attention to the invention or to commercially exploit it in some way. For example, in *Harrington Manufacturing Co., Inc. v. Powell Manufacturing*

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[45] 31 F.3d 1154, 1159–60 (Fed. Cir. 1994).

[46] *Id*.

[47] *Id*. at 1160.

[48] 213 U.S.P.Q 1002, 1982 WL 52163 (W.D. La. 1982).

[49] *Id.*; *cf.* Moleculon Research Corp. v. CBS, Inc., 793 F.2d 1261 (Fed. Cir. 1986), *cert. denied*, 479 U.S. 1030 (1987) (finding that the inventor of the Rubik's Cube did not place the device in public use even though he demonstrated it to friends and colleagues and subsequently allowed his boss to use the puzzle for a period of over eleven years prior to filing a patent application; the inventor's personal relationships and surrounding circumstances indicated that he always retained control over the device and the distribution of information about it).

[50] Martin, 213 U.S.P.Q. at 1002.

[51] *Id.*

Co., Inc.,[52] the district court found a public use where the inventor demonstrated his automatic tobacco harvester on four separate occasions prior to the critical date, including giving one demonstration to a reporter who wrote a newspaper article about the harvester. The observers were under no obligation of confidentiality, and the inventor testified that he *wanted* publicity for his invention.[53] In *Atlas v. Eastern Air Lines, Inc.*,[54] the First Circuit affirmed a finding that American Airlines' demonstration of a radar device to eight members of the press was for the sole purpose of publicizing its new developments in radar equipment and therefore constituted a public use.[55] And, in *Netscape Communications Corp. v. Konrad*,[56] the Federal Circuit affirmed a finding that Konrad's demonstration of a remote database object system to university computing personnel, for purposes of garnering support or endorsements, was an invalidating public use because no requirement of confidentiality was imposed on the attendees.[57]

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[52] 623 F. Supp. 872 (E.D.N.C. 1985).

[53] *Id*. at 875.

[54] 311 F.2d 156 (1st Cir. 1962).

[55] *Id.* at 162. *But see* Motionless Keyboard Co. v. Microsoft Corp., 486 F.3d 1376, 1385 (Fed. Cir. 2007) (where the court went to great lengths to reverse the district court's public use determination, despite the fact that the inventor demonstrated his novel ergonomic keyboard technology to a potential business partner, investors, a friend, and a typing tester prior to the critical date. The court found that all of the disclosures except for the typing test only provided a visual view of the keyboard, which was not connected to a computer, while the typing test was conducted under a nondisclosure agreement.).

[56] Netscape Comm. Corp. v. Konrad, 295 F.3d 1315, 1321–22 (Fed. Cir. 2002); *see also* Clock Spring, L.P. v. Wrapmaster, Inc., 560 F.3d 1317, 1325 (Fed. Cir. 2009) (finding that a demonstration of a method for repairing a pipe, attended by representatives of competing companies under no obligation of confidentiality, was a public use); *In re* Kaslow, 707 F.2d 1366, 1372–74 (Fed. Cir. 1983) (finding that prior demonstration of computerized supermarket UPC code system was public use).

[57] *Cf.* Sys. Mgmt. Arts Inc. v. Avesta Techs., Inc., 87 F. Supp. 2d 258, 268 (S.D.N.Y. 2000) (finding a triable issue as to whether numerous demonstrations of software made without assurances of confidentiality were "public uses"), Mformation Techs., Inc. v. Res. in Motion, Ltd., 830 F. Supp. 2d 815, 835 (N.D. Cal. 2011) (finding a factual dispute regarding whether an invention was in

Similarly, displaying or demonstrating an invention at a trade show may constitute a public use.[58] In *Faulkner v. Baldwin Piano & Organ Co.,*[59] public demonstration of an electronic organ at a show for the National Association of Music Manufacturers constituted a public use, even though the instrument was not available for sale to the public.[60] Marketability testing that involves use of the invention by consumers has also led to a finding of public use, particularly where the testing is intended to gather information that would allow the patent owner to maximize its sales after the product reaches the market.[61] However, merely

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public use, where evidence was limited to oral testimony that the inventor publicly demonstrated a prototype implementing the claimed invention), Articulate Systems, Inc. v. Apple Computer, Inc., 53 F. Supp. 2d 62, 75 (D. Mass. 1999) (denying summary judgment on issue of public use where, viewing evidence in light most favorable to Articulate, public demonstrations to four prospective customers were tightly controlled, were confidential, prototype displayed was rudimentary and unmarketable, and the customers did not receive prototypes).

[58] *See* M.D. Kaminsky and L.M. Sung, *Legal Significance of Trade Show Activity Under United States Patent Law,* 76 J. OF PAT. & TRADEMARK OFF. SOC'Y 445 (1994); *see also* Persistence Software, Inc. v. The Object People, Inc., 128 F. Supp. 2d 623, 627 (N.D. Cal. 2000) (finding a public use where Persistence's Exploder software was demonstrated at a trade show; the court stated, "Public use is construed broadly, and includes a public demonstration of the invention by the inventor."); Electro-Nucleonics, Inc. v. Mossinghoff, 593 F. Supp. 125, 128 (D.D.C. 1984) (finding "no question" that demonstration of patentee's centrifugal analyzer at a trade show was a public use).

[59] Faulkner v. Baldwin Piano & Organ Co., 561 F.2d 677 (7th Cir. 1977).

[60] *Id.* at 682–84. More recently, a district court held that displaying designs for patio chairs at a "pre-market" industry trade show was a public use because it was an effort to commercially exploit the invention. There was testimony that the chairs were displayed in "a very sellable way . . . no different than a furniture store." *See* Pride Family Brands, Inc. v. Carl's Patio, Inc., 992 F. Supp. 2d 1214, 1218 (S.D. Fla. 2014).

[61] *See In re* Smith, 714 F.2d 1127, 1135 (Fed. Cir. 1983) (holding that consumers were permitted to use carpet cleaning powder in their homes for two weeks, without any agreement of confidentiality, because the purpose of the test was to determine whether consumers would buy the product and how much they would pay for it). *Compare* Johnson & Johnson v. Kendall Co., 215 F. Supp. 124, 139 (N.D. Ill. 1963) (finding no public use where patent owner's advertising agency conducted a survey in which 100 housewives were asked to

showing photographs of an invention, as opposed to showing the actual invention itself, may not be enough to constitute a public use.[62]

In other instances, however, courts have found that various uses of inventions did not qualify as "public uses" because the uses were secret or the inventor had at least some expectation that the disclosure would be treated in a confidential manner. For instance, in *Xerox Corp. v. 3Com Corp.*,[63] a Xerox employee submitted a videotape showing himself demonstrating his invention (an alphabet of single-stroke characters for computerized handwriting recognition) to the co-chair of an industry conference, along with a paper he wrote about the invention.[64] Despite the absence of a written confidentiality agreement, the court concluded that the submission was made with an understanding and expectation of confidentiality, since it was made for the limited purpose of peer review to determine whether the inventor would be invited to present at the conference.[65]

Other courts have likewise held that lack of a written confidentiality agreement did not automatically place a disclosed invention in public use.[66] The Federal Circuit has stated, "[w]hen

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determine the efficacy of a new bandage; testing was conducted in presence of an interviewer and all bandages were used up in test), *with* Int'l Silver Co. v. Pomerantz, 271 F.2d 69, 72 (2d Cir. 1959) (exhibiting a mere photograph of the claimed invention, a design for silverware, to customers during a survey did not constitute "use" of the design).

[62] *See, e.g.*, Gargoyles, Inc. v. U.S., 32 Fed. Cl. 157, 167 (1994) (finding no public use although plaintiff admitted displaying a high-contrast photograph of its eyewear at a trade show, no public use found because defendant did not show that the utilitarian features of the eyeglasses were disclosed by or discernable from the photo); *Int'l Silver Co.*, 271 F.2d at 72.

[63] Xerox Corp. v. 3Com Corp., 26 F. Supp. 2d 492 (W.D.N.Y. 1998).

[64] *Id.*

[65] *Id.*

[66] Am. Seating Co. v. USSC Group, Inc., 514 F.3d 1262, 1268 (Fed. Cir. 2008) (inventors revealed a prototype of a tie-down device for wheelchairs to a select group of individuals without a written confidentiality agreement; however, the jury was entitled to conclude that the inventors and limited number of people allowed to view the device shared a general understanding of confidentiality).

access to an invention is clearly limited and controlled by the inventor, depending upon the relationships of the observers and the inventor, an understanding of confidentiality can be implied."[67] Conversely, when an inventor allows free and unrestricted access to an invention, with no requirement of confidentiality, the invention may be in public use.[68]

In other situations, exceedingly public disclosures of inventions were not found to be "public uses" because the inventor was still experimenting with the invention. In the historic case of *City of Elizabeth v. American Nicholson Pavement Co.*,[69] the Supreme Court refused to find a public use even where an experimental toll road was in use and members of the public drove on it daily for six years before the inventor filed a patent application. The Court stated, "[t]he use of an invention by the inventor himself, or of any other person under his direction, by way of experiment, and in order to bring the invention to perfection, has never been regarded as [a public use]."[70] More recently, in *TP Laboratories, Inc. v. Professional Positioners, Inc.*,[71] the Federal Circuit affirmed the district court's decision that the use of an orthodontic device in

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[67] *Id.*; *see also* Moleculon Res. Corp. v. CBS, Inc., 793 F.2d 1261, 1265-66 (Fed. Cir. 1986) (demonstrating implied understanding of confidentiality between inventor of Rubik's Cube and friends who saw the device); W.L. Gore & Assocs., Inc. v. Garlock, 721 F.2d 1540, 1549 (Fed. Cir. 1983) (finding that use of a Teflon-stretching machine in a factory was not a public use even though machine was visible to employees: employees were told to keep the machine confidential).

[68] Baxter Int'l, Inc. v. Cobe Laboratories, Inc., 88 F.3d 1054, 1059 (Fed. Cir. 1996) ("Suaudeau's lack of effort to maintain the centrifuge as confidential coupled with the free flow into his laboratory of people, including visitors to NIH, who observed the centrifuge in operation and who were under no duty of confidentiality supports only one conclusion: that the centrifuge was in public use.").

[69] City of Elizabeth v. Am. Nicholson Pavement Co., 97 U.S. 126, 136 (1877).

[70] *Id.* at 134. The court observed that "the nature of a street pavement is such that it cannot be experimented upon satisfactorily except on a highway, which is always public," and it determined that the inventor had a bona fide intention to test the durability of the road surface. *Id.*

[71] TP Labs., Inc. v. Prof'l Positioners, Inc., 724 F.2d 965, 973 (Fed. Cir. 1984).

three patients was experimental, even though the uses were open to public observation, under no obligation of confidentiality, and without other restrictions. The court made clear that "[i]t is not public knowledge of his invention that precludes the inventor from obtaining a patent for it, but a public use or sale of it."[72]

The Federal Circuit has developed a list of factors to be considered in determining whether a particular use constitutes an experimental use. Those factors include: (1) the length of the test period and number of tests as compared with a similar type of test on a similar type of design; (2) whether a user made any payment for the device; (3) whether a user agreed to use secretly; (4) whether records were kept of the progress of the test; and (5) whether persons other than the designer conducted the asserted experiments.[73] However, the purpose of the experiment must be to perfect the invention.[74] According to the Federal Circuit, "[w]hen an evaluation period is reasonably needed to determine if the invention will serve its intended purpose, the [public use] bar does not start to accrue while such determination is being made."[75] "Once an inventor realizes that the invention as later claimed indeed works for its intended purpose, further 'experimentation' may constitute a barring public use . . . . [E]xperimental use, which means perfecting or completing an invention to the point that it will work for its intended purpose, ends with actual reduction to

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[72] *Id.* at 970 (citing City of Elizabeth v. Am. Nicholson Pavement Co., 97 U.S. at 136); *see also* Tone Bros., Inc. v. Sysco Corp., 28 F.3d 1192, 1200 (Fed. Cir. 1994) (holding "that experimentation directed to the functional features of a product also containing an ornamental design may negate what otherwise would be a public use"). The inventor in *Tone Bros.* showed designs for spice bottles to a group of college students as part of a consumer study to determine which shape of bottle was preferred, without any requirement of confidentiality. 28 F.3d at 1200.

[73] Hycor Corp. v. Schlueter Co., 740 F.2d 1529, 1535 (Fed. Cir. 1994); TP Labs., Inc. v. Prof'l Positioners, Inc., 724 F.2d at 971-72.

[74] New Railhead Mfg., LLC v. Vermeer Mfg. Co., 298 F.3d 1290 (Fed. Cir. 2002).

[75] *Id.* at 1297 (citing Seal-Flex, Inc. v. Athletic Track & Court Constr., 98 F.3d 1318, 1324 (Fed. Cir. 1996)).

practice."[76] "Market testing and product introduction are [clearly] not experimental uses, since they are directed to commercialization of the invention."[77]

If a court is called upon to determine whether a capstone team's invention has been placed into public use, that court will likely take a number of factors into consideration. First, it will ask whether the invention is accessible to the public or whether it has been commercially exploited by the student inventors. It may consider whether the invention has been demonstrated to others or whether other activity relating to the invention occurred in public, whether confidentiality obligations were imposed on others, and evidence that the inventors were still experimenting and working to perfect the invention. Next, the court will ask whether the invention is ready for patenting and will look at whether the invention has been reduced to practice or whether the student inventors prepared detailed drawings that would enable a person of skill in the art to reproduce the invention.

As the capstone team moves from its preliminary proposals to prototyping and final evaluation, there appears to be an increasing danger that a court will view the team's invention as being in public use. Students may enter the capstone with an expectation of confidentiality in the information they share with their classmates

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[76] New Railhead Mfg., LLC v. Vermeer Mfg. Co., 298 F.3d at 1297-98 (citing RCA Corp. v. Data Gen. Corp., 887 F.2d 1056, 1061 (Fed. Cir. 1989)); *see also* Application of Blaisdell, 242 F.2d 779, 784 (C.C.P.A. 1957) (inventor was already satisfied with the functioning of his invention, and no additional experiments were necessary).

[77] Johns-Manville Corp. v. Certain-Teed Corp., 196 U.S.P.Q. 152, 1977 WL 22798 (C.D. Cal. 1977) (citing Cataphote Corp. v. DeSoto Chemical Coatings, Inc., 356 F.2d 24, 27 (9th Cir. 1966)); *In re* Smith, 714 F.2d 1127, 1135 (Fed. Cir. 1983) ("The experimental use exception, however, does not include market testing where the inventor is attempting to gauge consumer demand for his claimed invention. The purpose of such activities is commercial exploitation and not experimentation."); Omark Indus., Inc. v. Carlton Co., 652 F.2d 783 (9th Cir. 1980) (testing was undertaken primarily to assess merchantability, not for purposes of experimentation). *But see* Jay D. Schainholz, *The Validity of Patents After Market Testing: A New and Improved Experimental Use Doctrine?*, 85 COLUM. L. REV. 371 (1985).

and instructors, but during the course of the semester or year that expectation may gradually wither away. While students are not typically expected to sign a nondisclosure agreement as part of their participation in the capstone, the instructor may make a statement about confidentiality at the beginning of the course. However, courts may ask whether students fully appreciate the implications of such a statement or whether they intend to be bound by it, and it is unclear whether one student could enforce an obligation of confidentiality against a colleague or instructor who borrowed or disclosed his ideas.[78]

Further, student presentations and demonstrations do not generally take place in a closed environment. Capstone groups meet in university classrooms that are capable of accommodating the large number of students who may be enrolled in the course.[79] Those classrooms are open to the public and, particularly where there are many students in the course, it may be difficult to control access to the presentations. Guest lecturers may be invited to take part in the class, and other outsiders such as industry representatives and venture capitalists may be asked to participate as coaches or judges. Past courts have found that lack of effort to keep an invention secret, evidenced by a free flow of visitors who observe the invention and a general policy of openness, is sufficient to place the invention in public use.[80]

The relevant case law also suggests that a court may view such sharing of information regarding a capstone project as a public use, despite the fact that it takes place for the limited purpose of generating academic discussion and feedback about the merits of

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[78] *See* discussion *supra* notes 32-33. *But see* Cordis Corp. v. Boston Sci. Corp., 561 F.3d 1319, 1334 (Fed. Cir. 2009); Mass. Inst. of Tech. v. Harman Int'l Indus., Inc., 584 F. Supp. 2d 297 (D. Mass. 2008); Xerox Corp. v. 3Com Corp., 26 F. Supp. 2d 492 (W.D.N.Y. 1998) (all suggesting that there is an implied understanding of confidentiality in the university setting, although in the context of communications between faculty members and/or graduate students).

[79] Capstone courses at large universities may enroll as many as 75 or 100 students.

[80] *See, e.g.*, Baxter Int'l Inc. v. Cobe Labs., Inc., 88 F.3d 1054, 1056 (Fed. Cir. 1996).

the project. In the *Beachcombers* case,[81] the Federal Circuit upheld a finding of public use based on showing an invention to a small group of personal friends at a private party, even though the inventor was merely attempting to obtain feedback about her invention. Any indication that student inventors are providing information about their project or demonstrating their prototype to third parties in order to draw attention to their invention further increases the likelihood that a court may view the invention as being in public use.[82] Showing an invention to investors or industry representatives is particularly troubling, and any suggestion that students are attempting to commercially exploit an invention could be fatal to their claims.

As a result, by the time students begin demonstrating their prototypes and providing technical information about how they work, they may have a difficult time arguing that the invention is not "in public use."[83] Any claim of experimental use ends when the inventor reduces the invention to practice and knows that it will work for its intended purpose.[84] If the students participate in a public showcase or expo designed to highlight the accomplishments of the university's capstone teams, courts may have no trouble in finding a public use.

B. Printed Publications

"Whether a[] document qualifies as a 'printed publication' under Section 102 is a legal conclusion based on underlying factual

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[81] Beachcombers v. Wildewood Creative Prods., 31 F.3d 1154, 1156 (Fed. Cir. 1994).

[82] *See* Netscape Commc'ns Corp. v. Konrad 295 F.3d 1315, 1321-22 (Fed. Cir. 2002) (holding that demonstrating an invention to university personnel merely for purposes of garnering support or endorsements was a public use); *see also* Harrington Mfg. Co. v. Powell Mfg. Co., 623 F. Supp. 872 (E.D.N.C. 1985) (demonstrating an invention for purposes of publicity was sufficient to place the invention in public use).

[83] 35 U.S.C. § 102(a) (2013).

[84] *See* New Railhead Mfg., LLC v. Vermeer Mfg. Co., 298 F.3d 1290, 1297 (Fed. Cir. 2002); Application of Blaisdell, 242 F.2d 779, 784 (C.C.P.A. 1957).

determinations."[85] In order to qualify as a printed publication, a reference "must have been sufficiently accessible to the public interested in the art."[86] "'[P]ublic accessibility' has been called the *touchstone* in determining whether a reference constitutes a 'printed publication.'" [87] "Whether a reference is publicly accessible is determined on a case-by-case basis, based on the 'facts and circumstances surrounding the reference's disclosure to members of the public.'"[88]

There are many ways in which a reference can be made accessible to the public. Historically, courts focused on whether a reference had actually been disseminated or whether it was indexed or otherwise made available such that a reasonably diligent researcher could locate it.[89] The Federal Circuit indicated that, before the critical date, the reference must have been sufficiently accessible to the public interested in the art; "dissemination and public accessibility are the keys to the legal determination whether a prior art reference was 'published.'"[90]

Several courts considered whether a document was indexed in such a manner that it became publicly accessible. In *Hall*, the Federal Circuit determined that a doctoral thesis submitted to the Department of Chemistry and Pharmacy at Freiburg University in Germany constituted a printed publication, where the thesis was

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[85] SRI Int'l, Inc. v. Internet Sec. Sys., Inc., 511 F.3d 1186, 1192 (Fed. Cir. 2008) (citing Cooper Cameron Corp. v. Kvaerner Oilfield Prod., 291 F.3d 1317, 1321 (Fed. Cir. 2002)).

[86] *In re* Lister, 583 F.3d 1307, 1311 (Fed. Cir. 2009) (citing *In re* Cronyn, 890 F.2d 1158, 1160 (Fed. Cir. 1989)).

[87] SRI Int'l, Inc. v. Internet Sec. Sys., Inc., 511 F.3d at 1194 (quoting *In re* Hall, 781 F.2d 897, 898-99 (Fed. Cir. 1986)).

[88] *In re* Lister, 583 F.3d at 1311 (quoting *In re* Klopfenstein, 380 F.3d 1345, 1350 (Fed. Cir. 2004)).

[89] *See* Bruckelmyer v. Ground Heaters, Inc., 445 F.3d 1374, 1378 (Fed. Cir. 2006); Kyocera Wireless Corp. v Int'l Trade Comm'n, 545 F.3d 1340, 1350 (Fed. Cir. 2008).

[90] *In re* Cronyn, 890 F.2d at 1160 (quoting Constant v. Advanced Micro-Devices, Inc., 848 F.2d 1560, 1568 (Fed. Cir. 1988)); *see also In re* Klopfenstein, 380 F.3d at 1348 n. 3 (explaining that the *Cronyn* court used the word "disseminate" in its literal sense (i.e., "make widespread" or "to foster general knowledge of")).

filed with and indexed in the university library, and evidence of the library's general practices established that it was available to the public prior to the critical date.[91] Conversely, in *Cronyn*, the court held that three undergraduate theses relating to a compound that could be useful in treating cancer were not "printed publications" because, although copies were filed in the university's main library and the students' department, the theses were only indexed by student name and title of the work. They were not generally indexed or cataloged, and therefore they were not sufficiently accessible to the public to constitute "printed publications."[92] In *Lister,*[93] the Federal Circuit also found that there was insufficient evidence to show that a manuscript describing a method for playing golf was publicly accessible as of the critical date, even though a copy of the manuscript had been filed with the Copyright Office over a year before.[94]

However, if a document has actually been disseminated to the public, it may be irrelevant whether that document is indexed in a meaningful way. For example, in *Massachusetts Institute of Technology v. AB Fortia,* [95] a researcher delivered an oral presentation at a conference. Afterward, copies of his paper were distributed on request, without any restrictions on disclosure.[96] The court determined that the paper constituted a printed publication because over fifty persons skilled in the art were actually told of

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[91] *In re* Hall, 781 F.2d 897 (Fed. Cir. 1986).

[92] *In re* Cronyn, 890 F.2d at 1160; *see also In re* Bayer, 568 F.2d 1357 (C.C.P.A. 1978) (noting that the thesis that was not indexed before the critical date was not sufficiently accessible; the court indicated that the date on which the public actually gained access to the invention through the publication was the focus of the inquiry).

[93] *In re* Lister, 583 F.3d 1307 (Fed. Cir. 2009).

[94] *Id*. The court determined that Dr. Lister's manuscript was not publicly accessible through a search of the Copyright Office's automated catalog, which would only allow searches based on the author's name and the first word in the title of the work. However, the court observed that the manuscript *was* publicly accessible as of the date that it was included in either Westlaw or Dialog, both of which permitted keyword searching of titles. *Id.*

[95] Mass. Inst. of Tech. v. AB Fortia, 774 F.2d 1104 (Fed. Cir. 1985).

[96] *Id.* at 1106.

the existence of the paper and informed of its contents during the oral presentation, and the document itself was actually distributed without restrictions to at least six persons.[97]

Moreover, public display of a document may constitute a "printed publication"[98] even when the author does not distribute copies of the work to the public; merely making the document available for view may be enough. In *Klopfenstein*,[99] the court considered a situation where a fourteen-slide presentation concerning methods of preparing foods using extruded soy fiber was printed and pasted onto poster boards, and then displayed continuously for two and one-half days at a meeting of the American Association of Cereal Chemists.[100] Later, the posters were displayed for less than a day at an Agricultural Experiment Station at Kansas State University.[101] No actual copies of the posters were disseminated, but the posters contained no disclaimer prohibiting notetaking or copying of the presentation.[102] The Federal Circuit set out a list of factors to be considered in determining whether a temporarily-displayed reference that was neither distributed nor indexed was nonetheless made sufficiently accessible to count as a printed publication, including "the length of time the exhibit was displayed, the expertise of the target audience, the existence (or lack thereof) of reasonable expectations that the material displayed would not be copied, and the simplicity or ease with which the material displayed could have been copied."[103] Applying these factors, the court held that

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[97] *Id.* at 1109. *Cf.* Cordis Corp. v. Boston Sci. Corp., 561 F.3d 1319, 1334–35 (Fed. Cir. 2009) (stating that, although a university researcher gave copies of two papers to university and hospital colleagues, those papers were not "printed publications" because academic norms gave rise to an expectation of confidentiality); *see* cases cited *supra* note 41.

[98] 35 U.S.C. §102(a) (2012).

[99] 380 F.3d 1345 (Fed. Cir. 2004).

[100] *Id.* at 1347.

[101] *Id*.

[102] *Id.*

[103] *Id.* at 1350. The court held that there is no requirement that a document be either distributed or indexed in order to constitute a "printed publication." For example, the court stated, "a public billboard targeted to those of ordinary skill

Klopfenstein's poster presentation was sufficiently accessible to count as a printed publication because it was shown for an extended period of time to members of the public having ordinary skill in the art of the invention, the viewers were not precluded from taking notes or photographing the posters, and the reference was presented in such a way that it would have been easy to copy the information it contained.[104]

Further, in determining what constitutes a printed publication, the courts have taken account of changes in technology. In *Wyer,*[105] the court recognized that the term "printed publication" includes anything that is available to the public in tangible form, not only materials that are printed using traditional printing methods.[106] Documents stored on a computer or in electronic format can also constitute printed publications for purposes of Section 102.[107] More recently, in *Suffolk Technologies, LLC v. AOL, Inc*.,[108] the court found that a Usenet newsgroup post was a printed publication within the meaning of Section 102.[109]

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in the art that describes all of the limitations of an invention and that is on display for the public for months may be neither 'distributed' nor 'indexed'—but it most surely is 'sufficiently accessible to the public interested in the art' and therefore, under controlling precedent, a 'printed publication.'" *Id.* at 1348.

[104] *Id.* at 1351. *But see* Regents of the Univ. of Cal. v. Howmedica, Inc., 340 F. Supp. 846, 860 (D.N.J. 1981) (projection of slides at a lecture that was limited in duration and did not disclose the invention to the extent necessary to enable a person of ordinary skill in the art to make or use the invention was not a printed publication).

[105] *In re* Wyer, 655 F.2d 221 (C.C.P.A. 1981).

[106] *See id.* at 226 ("printed publication" includes a microfilmed document).

[107] Voter Verified, Inc. v. Premier Election Sols., Inc., 698 F.3d 1374, 1379-80 (Fed. Cir. 2012) (holding that an article available only through an online publication was publicly accessible).

[108] 752 F.3d 1358 (Fed. Cir. 2014).

[109] *Id.* at 1365. The court determined that the Usenet newsgroups were organized in a hierarchical manner, and someone interested in the topic could easily locate a list of posts in the newsgroup. Further, the court again stated that a printed publication need not be easily searchable if it was sufficiently disseminated at the time of publication. Today, Usenet postings can be searched by keyword. *But see* Blue Calypso, LLC v. Groupon, Inc., 815 F.3d 133 (Fed.

In the engineering capstone courses, students routinely create slideshow presentations that contain technical information and drawings related to their invention. The teams are required to prepare final written reports containing detailed technical descriptions of the invention and their inventive process. In some instances, those reports may even discuss prior art references about which the students have knowledge, as well as information about how they designed around those references. The reports may be distributed to faculty supervisors, industry mentors and judges, and other third parties.

Slideshow presentations and other information documenting the invention may also be displayed at the capstone showcase at the end of the course, and in some instances they may be displayed online.[110] In addition to displays on university websites, many students also create video demonstrations of their inventions and post them on YouTube and other Internet sites.[111] Indeed, some capstone courses actually require the students to produce videos demonstrating their inventions and explaining their operation and technical merit.

In every one of these instances, there is a real danger that the USPTO or a court might find that student presentations, reports, and videos constitute "printed publications" that could ultimately result in loss of the right to obtain a patent. A court could conclude

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Cir. 2016), 2016 WL 791107, at *13 (Mar. 1, 2016) (holding that document appearing only on an individual's personal webpage not publicly accessible, where there was no evidence that a search engine query, using any combination of search terms, would have disclosed it).

[110] *See*, *e.g.*, OHIO STATE UNIV. COLL. OF ENG'G., *Ohio State Capstone Design Showcase*, https://eeic.osu.edu/capstone-design-showcase-0 (last visited Oct. 29, 2016) (showing photographs of students standing in front of poster presentations relating to their capstone projects).

[111] *See, e.g.*, Intelekreka Consultant, *IDP Capstone Project Civil Engineering UiTM 2014 – Tunnel Formwork System*, YOUTUBE (Nov. 14, 2014), https://www.youtube.com/watch?v=YB3pF7NkN0s; Michael Watson, *UCSB Mechanical Engineering Capstone Video*, YOUTUBE (May 30, 2014), https://www.youtube.com/watch?v=mtsCDgUa7QM; Barry Son, *Electrical & Computer Engineering Capstone 2012 Northeastern University*, YOUTUBE (Jul. 2, 2012), https://www.youtube.com/watch?v=mGv4tFWE5-c.

that any one of these items is accessible to the public. Classmates, instructors, and third parties can not only view in-class slideshow presentations, but also anyone in attendance who has a cellphone can easily photograph the slides being displayed. Written reports are often freely disseminated not only to faculty supervisors, but also to members of the public including investors, members of industry, and university representatives. Virtually any person with a computer or mobile device can view videos that are posted on the Internet around the world, and sites like YouTube make it extremely easy to locate videos of interest. A court may have little difficulty in determining that any or all of these materials constitute printed publications because they were actually disseminated to the public or are indexed in a meaningful way.

C. "Otherwise Available To The Public"

Section 102 of the America Invents Act contains new language that was not included in previous definitions of prior art. Specifically, Section 102(a)(1)[112] states that a person shall be entitled to a patent unless "the claimed invention was patented, described in a printed publication, or in public use, on sale, *or otherwise available to the public* before the effective filing date of the claimed invention."[113] The phrase "otherwise available to the public"[114] is not defined in the Act, and the meaning that should be accorded to the phrase is unclear.

Several definitions of the term "otherwise available to the public" have been proposed.[115] It has been suggested that the words "otherwise available to the public" were merely intended to modify the preceding language in the new version of Section 102

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[112] 35 U.S.C. § 102(a)(1) (2013).

[113] *Id.* (emphasis added).

[114] *Id.*

[115] *See* Paul Morgan, *The Ambiguity in Section 102(a)(1) of the Leahy-Smith America Invents Act*, 2011 PATENTLY-O PAT. L.J. 29, 33-4 (2011). Morgan proposes that the language may operate as a limitation on the prior art effect those inventions that are "on sale," thereby eliminating secret sales as prior art. *Id.*

("in public use, on sale, or otherwise available to the public").[116] The House Report on AIA[117] states that the "available to the public" language was added to clarify the broad scope of relevant prior art, as well as to emphasize the fact that prior art must be publicly accessible.[118] One commentator has suggested that:

> [w]hether an invention has been made available to the public is the same inquiry that is undertaken under existing [i.e., pre-AIA] law to determine whether a document has become publicly accessible, but it is conducted in a more generalized manner to account for disclosures of information that are not in the form of documents.[119]

The USPTO has taken a much broader view of what it means for a reference to be "otherwise available to the public." In its Examination Guidelines for Sections 102 and 103, the USPTO takes the position that the "otherwise available to the public" language is a "catch-all" provision that defines a "new . . . category

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[116] *See* CHISUM ON PATENTS, *supra* note 42, at AIA-51. Professor Chisum has also suggested that "otherwise available to the public" is similar to the definition of absolute novelty under the European Patent Convention, which encompasses "everything made available to the public by means of a written or oral description, by use, or in any other way." *See Id.* § 3.3.3.1 (citing European Patent Convention Article 54(2)). *But see* Dale Bjorkman, Gilberg Voortmans & Lindsay M. Block, *"Made Available to the Public" – Understanding The Differences Of The America Invents Act From European Patent Convention In Its Definition Of Prior Art*, 4 CYBARIS AN INTELL. PROP. L. REV. 191 (2013).

[117] H.R. REP. NO. 112-98, at 43 (2011).

[118] *Id.*

[119] Joe Matal, *A Guide to the Legislative History of the America Invents Act: Part I of II*, 21 FED. CIRCUIT B.J. 435, 469 (2011); *see also* 157 CONG. REC. S1042 (Mar. 1, 2011) (statement of Sen. Kyl) ("[A]vailable to the public" means the same thing that 'publicly accessible' does in the context of a publication. Subject matter makes an invention publicly accessible or available if an interested person who is skilled in the field could, through reasonable diligence, find the subject matter and understand the invention from it."); Robert A. Armitage, *Understanding the America Invents Act and Its Implications for Patenting*, 40 AIPLA Q.J., 1, 59 (Winter 2012) ("Whether an invention has been made available to the public is the same inquiry that is undertaken under existing law to determine whether a document has become publicly accessible, but is conducted in a more generalized manner to account for disclosures of information that are not in the form of documents.").

of . . . prior art."[120] The Patent Office states this catch-all provision allows its patent examiners and other decision makers to focus on whether the disclosure was "available to the public," rather than being bound by the means through which the claimed invention became available to the public. The USPTO's Examination Guidelines explicitly state that an invention may be available to the public where it is the subject of "a student thesis in a university library, a poster display or other information disseminated at a scientific meeting, subject matter in a laid-open patent application, a document electronically posted on the Internet, or a commercial transaction that does not constitute a sale under the Uniform Commercial Code."[121]

Similarly, in the training materials it distributes to its examiners, the USPTO states that "otherwise available to the public" is a new catch-all provision that has no counterpart in pre-AIA law.[122] The types of things that may qualify as prior art under the AIA include "an oral presentation at a scientific meeting," "a demonstration at a trade show," "a lecture or speech," "a statement made on a radio talk show," and "a YouTube video, Web site, or other on-line material."[123] Thus, the USPTO apparently believes that, while these types of disclosures may have been close calls at best under pre-AIA law, they now constitute prior art if the subject matter is available to the public in some way.

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[120] Examination Guidelines for Implementing the First Inventor to File Provisions of the Leahy-Smith America Invents Act 78 Fed. Reg. 11059, 11075 (Feb. 14, 2013) [hereinafter EXAMINATION GUIDELINES]. Note that the examination guidelines do not constitute substantive rulemaking and do not have the force and effect of law. Instead, they set out the USPTO's interpretation of the amendments enacted by the AIA. *Id*. at 11059; *see also* USPTO, MANUAL OF PATENT EXAMINING PROCEDURE § 2152.02(e) (9th ed. 2015) [hereinafter "MPEP"].

[121] EXAMINATION GUIDELINES, *supra* note 120, at 11075 (citations omitted).

[122] USPTO, First Inventor to File (FITF) Comprehensive Training: Prior Art Under the AIA, http://www.uspto.gov/aia_implementation/fitf_comprehensive_training_prior_art_under_aia.pdf.

[123] *Id.* The USPTO notes that YouTube videos, websites, and online materials may also qualify as printed publications under AIA and pre-AIA law.

Further, a disclosure may be accorded prior art effect even if it contains a relatively low level of detail. In order for a disclosure to be used to show that the invention patent claim is anticipated under 35 U.S.C. § 102, "each and every element of the claimed invention" must be disclosed either explicitly or inherently, and the elements must be "arranged or combined in the same way as in the claim."[124] Additionally, the prior art disclosure must enable a person of ordinary skill in the art to *make* the invention without undue experimentation, but there is no requirement that a disclosure teach a person skilled in the art to *use* the invention.[125] However, far less detail may be required where a prior art disclosure is used to support an obviousness rejection under 35 U.S.C. § 103,[126] and a reference that is not fully enabling may be prior art for purposes of obviousness.[127] "In accordance with pre-AIA case law concerning obviousness, a disclosure may be cited

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[124] EXAMINATION GUIDELINES, *supra* note 120, at 11074; *see also* MPEP § 2152.02(e).

[125] EXAMINATION GUIDELINES, *supra* note 120, at 11074. The USPTO distinguishes between the disclosure requirements imposed on a patent applicant under 35 U.S.C. § 112(a) and the level of detail required in a prior art reference. In order to satisfy the requirements for patentability, a patent applicant must provide a written description of the claimed invention that enables a person of ordinary skill in the art to make and use the entire scope of the invention. An anticipatory prior art reference, on the other hand, is only required to disclose all elements of the claimed invention arranged in the same way as they are in the claim, and also provide sufficient guidance to enable a person skilled in the art to make (but not to use) the claimed invention. Further, the prior art document is only required to describe and enable one skilled in the art to make one embodiment (or a single species) of the claimed invention; it need not describe and enable the entire scope of the claimed invention.

[126] The standard for obviousness is set forth in § 103, which provides:

"A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made." 35 U.S.C. § 103 (2012); *see also* KSR Int'l v. Teleflex Inc., 550 U.S. 398 (2007).

[127] *See* CHISUM ON PATENTS, *supra* note 42, at AIA-51.

for all that it would reasonably have made known to a person of ordinary skill in the art."[128] As a result, even if a disclosure does not qualify as anticipatory prior art under Section 102, it may still be used by the examiner as the basis for an obviousness rejection.

Based on the USPTO's interpretation, many of the activities undertaken by student capstone teams that did not previously have prior art effect may now constitute disclosures because they make the subject matter of the invention "otherwise available to the public."[129] If the broad construction of "otherwise available to the public" proposed by the USPTO is given effect, then the students' oral presentations, product demonstrations, poster displays, and Internet postings will all potentially constitute disclosures that start the clock for those students to file a patent application and which could result in loss of the right to obtain a patent if they do not act in a timely manner. Even videos, posters, and product demonstrations that are not fully enabling to a person of skill in the art could potentially be used to support an obviousness rejection. To date, no court has construed the "otherwise available to the public" language that AIA added to Section 102. However, the lack of clarity about the proper interpretation of this exception leads to increased uncertainty about the status of student inventions and their potential patentability.

III. CLASSROOM PRESENTATIONS AND REPORTS SHOULD DO NOT CONSTITUTE NOVELTY-DEFEATING DISCLOSURES

Engineering capstone courses frequently encourage students to develop potentially patentable products that could be commercialized by others or could form the basis of a startup company owned by the student inventors. It would be erroneous to characterize classroom presentations and demonstrations by those students, made in partial fulfillment of the requirements of an academic program, as novelty-defeating disclosures and to deny patent protection to student inventors based on those closed activities. Universities can, however, implement several best

[128] EXAMINATION GUIDELINES, *supra* note 120, at 11074.
[129] 35 U.S.C. § 102(a) (2012).

practices to reduce the possibility that classroom activities will lead to an unexpected loss of patent rights.

A. Fundamental Policies Mandate That Classroom Activities Not Be Treated As Prior Art "Disclosures"

Every situation must be evaluated on its own merits and the totality of the circumstances surrounding a particular invention must always be taken into account. However, when viewed in light of the public policy considerations underlying the public use and publication bars, it becomes apparent that the vast majority of capstone classroom activities should be not treated as public disclosures and should not be given prior art effect to defeat the students' right to obtain a patent.

In the initial stages of the capstone program, student inventors have nothing to disclose. That is, there is no invention that can be in public use or described in a printed publication. In the first phase of the capstone, student reports and discussions simply relate the problems that will form the basis of their capstone projects; nothing has been invented yet and, as a result, nothing can be disclosed.[130] By way of example, a biomedical engineering capstone team might identify the need for a stronger but more flexible coronary stent as a problem for investigation. However, until the team develops a workable solution to the problem, the

[130] *See, e.g.*, Constant v. Advanced Micro-Devices, Inc., 848 F.2d 1560, 1569 (Fed. Cir. 1988) (to constitute a printed publication, a document must be enabling); Pixion, Inc. v. Citrix Sys., Inc., 887 F. Supp. 2d 881 (N.D. Cal. 2012); Cot'n Wash, Inc. v. Henkel Corp., 56 F. Supp. 3d 626, 646-47 (D. Del. 2014) (issue of fact existed as to whether samples shown to the public before the critical date actually embodied the claimed invention).

team has no invention to disclose.[131] Inventions are *solutions* to problems, not identification of the problems themselves.[132]

But even when the capstone teams have devised solutions to their problems and are reducing their inventions to practice-by-building and testing prototypes, their classroom discussions and reports should likely be viewed as confidential. Most students have an understanding and expectation of confidentiality in the information they share with their classmates and advisors. At the beginning of the capstone experience, the faculty supervisor may instruct the class that all discussions, presentations, and reports must be treated in a confidential manner. If such an instruction is given, there is an explicit understanding of confidentiality, even if the students and advisors do not sign a nondisclosure agreement, and their expectation of confidentiality is not otherwise memorialized in writing.[133]

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[131] *See* Del Mar Engineering Labs. v. PhysioTronics, Inc., 642 F.2d 1167, 1169 (9th Cir. 1981). The district court in this case found that a student's exhibit of his device for electronically measuring a segment of the human heartbeat at two meetings of the American Medical Association, and its subsequent use at a hospital, all took place while the device was in the developmental stage and therefore did not constitute a public use. On appeal, the Ninth Circuit held that this finding was not clearly erroneous.

[132] To the extent students are only making oral presentations regarding their inventions and no documents are produced, evidentiary considerations may also weigh in their favor regarding whether those presentations constitute a public use. Courts are extremely reluctant to accept oral testimony that would invalidate a patent, since there is often a strong incentive for a witness to remember facts in a way that are favorable to their allegation of invalidity. Oral testimony must be corroborated in order to invalidate someone's patent rights. *See* Juicy Whip, Inc. v. Orange Bang, Inc., 292 F.3d 728 (Fed. Cir. 2002) (setting forth several factors that must be considered in evaluating the credibility of oral statements, including (1) delay between event and trial, (2) interest of the witness, (3) contradiction or impeachment, (4) corroboration, (5) witnesses' familiarity with details of alleged prior structure, (6) improbability of prior use considering state of the art, (7) impact of the invention on the industry, and (8) relationship between witness and alleged prior user). In addition, it must be clear that the thing in public use actually anticipates the claimed invention. *Id.* at 737-38.

[133] *See* Delano Farms Co. v. Ca. Table Grape Comm'n, 778 F.3d 1243, 1248 (Fed. Cir. 2015) ("We have never required a formal confidentiality agreement to

Further, academic norms argue in favor of finding that capstone presentations and reports are confidential and do not constitute "public uses" or "printed publications." Several courts have already acknowledged that there is an implied understanding of confidentiality in the university setting. In *Cordis Corp. v. Boston Scientific Corp.*,[134] the Federal Circuit noted that it is reluctant to find that something is a printed publication "[w]here professional and behavioral norms entitle a party to a reasonable expectation" that information will not be copied or further distributed.[135] The court then held that an inventor's distribution of copies of his monographs to university and hospital colleagues did not render the monographs prior art printed publications because professional and academic norms gave rise to an expectation that the disclosures would remain confidential.[136] The court recognized the importance of "preserv[ing] the incentive for inventors to participate in academic presentations or discussions."[137]

In a similar situation in *Xerox Corp. v. 3Com Corp.*,[138] a federal district court found that a video demonstration of an invention submitted to the chair of an industry conference for the limited purposed of determining whether it is accepted for presentation at a future scientific conference did not constitute a "public use" or a "printed publication" under Section 102, because the submission was made with an understanding and expectation of confidentiality.[139] Although there was no express confidentiality

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show non-public use . . . . [T]he presence or absence of [an express confidentiality] agreement is not determinative of the public use issue."). Instead, we evaluate whether there were "circumstances creating a similar expectation of secrecy." *Id.*

[134] 561 F.3d 1319 (Fed. Cir. 2009).

[135] *Id*. at 1333-34.

[136] *Id.* at 1334.

[137] *Id*. at 1334. The court also found that the inventor's disclosures to two commercial entities were entitled to an expectation of confidentiality because the inventor asked the entities to keep his work confidential, even though his written agreement with one of the companies specifically disclaimed any confidentiality requirement. *Id.*

[138] 26 F. Supp. 2d 492 (W.D.N.Y. 1998).

[139] *Id.* at 496.

agreement, the industry reviewer was under a professional ethical obligation to treat the material as confidential.[140]

In the context of capstone courses, it is vital to recognize that there is an understanding and expectation of confidentiality between the students in the class, as well as with their faculty members and outside advisors. Students feel safe in the classroom environment. They are there to learn, and they are entitled to trust their professors and others who act as advisors and mentors that provide guidance and support. Students have a right to expect that the university will protect them and safeguard their interests. Academic norms and professional ethics weigh heavily against any conclusion that classroom discussions, presentations, or reports constitute prior art "disclosures."

It would also be a mistake to overlook the fact that such discussions and reports are not entirely voluntary. Students provide weekly progress reports about their work, they demonstrate their inventions to their classmates and advisors, and they prepare final written reports detailing their inventions in order to receive a grade for the capstone course and graduate with an engineering degree. Students are not disclosing their inventive processes and resulting innovations for purposes of commercializing their inventions. Instead, they are reporting on their work so that they can be evaluated by their supervisors.

Although periodic reporting may be mandatory, student teams otherwise remain in control of their inventions during the capstone course, and typically there should be no reason for others to believe that their inventions are freely available to the public. In

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[140] *Id*. *But see* Mass. Inst. of Tech. v. Harman Int'l Indus., Inc., 584 F. Supp. 2d 297, 313 (D. Mass. 2008). The court struggled to find that there was an implied understanding of confidentiality in field trials conducted by MIT, even though MIT had a written "Open Research and Free Interchange of Information" policy at the time the trials were conducted and encouraged the openness of research among scholars. Despite the policy and the lack of written confidentiality agreements, the court found the evidence was insufficient to conclude as a matter of law that MIT and the drivers of cars in the field trials lacked any implied duty of confidentiality. Mass. Inst. of Tech., 584 F. Supp. 2d at 313.

Moleculon Res. Corp. v. CBS, Inc.,[141] the inventor, Nichols, conceived of a three-dimensional puzzle and, over the course of five years, showed paper models of the puzzle to his fellow graduate students and friends. Some years later, he built another model of the puzzle, which he sometimes took to his office and eventually loaned to his supervisor. Nichols eventually applied for a patent nearly 13 years after he first conceived of the invention and after showing his prototype to multiple third parties, yet the Federal Circuit found that there was no public use.[142] The court reasoned that Nichols had not given over the invention for free and unrestricted use by another person.[143] Even though Nichols showed the puzzle to his graduate student friends and allowed his supervisor to use it briefly, all without the benefit of a confidentiality agreement, the court found that he always retained control over the puzzle's use and the distribution of information about the puzzle.[144]

Similarly, in the context of engineering capstone teams, there is no basis to conclude that students are surrendering control over their inventions or causing the public to believe they are freely available when they provide in-class progress reports and demonstrations and submit final written reports describing the technical aspects of their inventions. So long as a student team does not give or sell its invention to a third party for that party's free and unrestricted use, their inventions remain private. Classroom activities are strictly for the students' personal benefit.

The U.S. patent system has two competing goals. Admittedly, it is designed to encourage early disclosure of inventions and to prevent inventors from commercially exploiting their inventions for longer than the statutorily prescribed time.[145] The system also seeks to discourage the removal from the public domain of

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[141] 793 F.2d 1261 (Fed. Cir. 1986).
[142] *Id.* at 1266-67.
[143] *Id.* at 1266.
[144] *Id.*
[145] Tone Bros., v. Sysco Corp., 28 F.3d 1192, 1198 (Fed. Cir. 1994); *see also* Metalizing Eng'g Co. v. Kenyon Bearing & Auto Parts Co., 153 F.3d 516 (2d Cir. 1946) (regarding secret exploitation of a reconditioning process).

inventions the public has come to believe are freely available.[146] At the same time, the laws are intended to reward inventors for the fruits of their labor, their creativity, and their investments in innovative technologies.[147] The one-year grace period in Section 102 is designed to give an inventor a reasonable amount of time following sales activity or other disclosures to determine the potential economic value in seeking patent protection and then to prepare and file a patent application.

Penalizing students by characterizing their class discussions and reports as novelty-defeating disclosures would do nothing to further the goals of our patent system and its policies. Instead, it would simultaneously discourage future inventors and dedicate potentially valuable inventions to the public while depriving hardworking and well-meaning student-inventors of the fruits of their labor.[148] In turn, the public may also be deprived of the benefits of important new technologies since, without patent protection, commercial entities may be unwilling to bring student inventions to market.

B. Suggested Best Practices

While the circumstances of capstone courses and public policy considerations generally favor finding that student presentations

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[146] Tone Bros., 28 F.3d at 1198.

[147] *See generally* WILLIAM M. LANDES & RICHARD A. POSNER, THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW 294-96 (Belknap Press, 2003).

[148] Public displays at the conclusion of the capstone course must be viewed differently and may well constitute disclosures that trigger the beginning of the one-year period during which a patent application must be filed. When members of the general public (including disinterested investors and industry employees) are invited to attend a capstone event showcasing the work of the student teams and providing working demonstrations and technical details relating to their inventions, it becomes much more difficult to argue that the student inventions were not in public use or that posters and other materials disseminated to the public did not constitute printed publications. Hopefully, during the year following completion of the capstone course and graduation from college, the students will become employed and will have sufficient funds available to retain legal counsel to assist them with filing a patent application.

and reports do not rise to the level of prior art disclosures, universities should take steps to ensure the confidentiality of classroom discussions and preserve the potential patent rights of their students. The current uncertainty about when an invention becomes "otherwise available to the public" creates an even more compelling reason to do so. Several best practices should be adopted by any engineering school or other academic department offering a course where students are expected to create innovative products or services.

First, schools should develop written policies addressing ownership and protection of intellectual property created in a capstone course. Most major research universities have adopted general intellectual property policies relating to ownership of inventions, works of authorship, and other intellectual assets created by university faculty, staff, and students.[149] Those policies are frequently written in abstract terms and are difficult to understand without the assistance of a trained legal professional. Undergraduate students may be unaware of the existence of a university-wide IP policy or may not understand how those policies apply in the context of a capstone course.[150]

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[149] Many university IP policies provide that students own all inventions they create as part of their academic activities, even where they have made substantial use of university facilities or funds. *See, e.g.*, University of Maryland Policy on Intellectual Property, UNIV. OF MD., http://www.president.umd.edu/policies/docs/IV-320A.pdf (last visited Oct. 29, 2016) ("Students shall own all inventions and all rights, including those under patent law, in inventions they create as part of their University academic and research activities, whether or not they use Resources Beyond Those Usually and Customarily Provided."). *But see* MIT Policy on Ownership of Intellectual Property, MASS. INST. OF TECH., http://web.mit.edu/policies/13/13.1.html (last visited Oct. 29, 2016) ("When Intellectual Property is developed by MIT faculty, students, staff, visitors, or others participating in MIT programs using significant MIT funds or facilities, MIT will own the Intellectual Property.").

[150] Complicated issues about ownership may arise particularly where an outside sponsor proposes a capstone project and agrees to underwrite the costs associated with a team's work. In those circumstances, students may feel confused about whether they own the technologies they are creating or whether they essentially stand in the shoes of an employee and have responsibilities to the sponsor.

Every engineering school or department should therefore adopt a capstone policy that supplements the university IP policy with a set of principles directed to the issues likely to arise in the context of its capstone offerings. The capstone policy should clearly state whether intellectual property created in a capstone course will be owned by the student inventors, by the university, or by an outside sponsor of a capstone project.[151] That is, students should be informed whether the capstone project could potentially result in their ownership of a patentable invention. The capstone policy should also set clear expectations regarding confidentiality of student presentations and reports, and it should offer students options for enhanced privacy when that is desired. The policy should be distributed to students and advisors at the beginning of the capstone, and it should be written in language that is readily accessible to undergraduate students. Such a policy would promote clarity and understanding among all capstone participants.

Next, engineering schools should provide training on basic intellectual property issues for their students, faculty members, and other advisors who participate in capstone courses. Currently, few engineering programs offer any substantial instruction on intellectual property law,[152] even though an understanding of how to recognize and protect patent and trade secret rights will be

[151] One possibility might be for the university to exert ownership over inventions created in its capstone courses. University ownership could create an environment in which students, faculty members, and others would be more free to talk, share ideas about the products under development, and collaborate on their completion. Such a setting would more closely resemble the situation within a company, where co-workers freely collaborate and discuss ideas without the company being placed in danger of losing its IP rights. However, university ownership of capstone inventions appears to violate the very nature of the undergraduate student's relationship with the university. Students pay tuition; indeed, a significant amount of an undergraduate student's tuition dollars may go towards participation in a mandatory, two-semester capstone course. As a result, students may have a reasonable expectation that they will own anything they create in the course of their studies, including patentable inventions.

[152] At most, some engineering students may receive a one-hour overview of intellectual property as part of a course on the engineering profession or ethics.

fundamental skills for their students' future roles as engineers.[153] Incorporating intellectual property education into the capstone course would address at least two concerns: it would give students tools they need to better protect the inventions they may be creating during the capstone, and it would provide invaluable training that will assist students when they become employed in industry or create their own technology startups. Faculty members who supervise capstone courses should also be required to participate in basic IP training so that they are prepared to design courses that are better suited to the needs of their students.[154]

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[153] A recent article in Forbes magazine argued, "[u]niversities need to do a better job at preparing their graduates to be productive citizens of the innovation economy, and that includes giving more attention to IP education." Jon Villasenor, *Intellectual Property Awareness at Universities: Why Ignorance Is Not Bliss*, FORBES (Nov. 27, 2012), http://www.forbes.com/sites/johnvillasenor/2012/11/27/intellectual-property-awareness-at-universities-why-ignorance-is-not-bliss/ (proposing that all graduate students in STEM disciplines be required to participate in a short course on IP Basics).

[154] Currently, some university technology transfer offices have information on their websites regarding classroom discussions, public presentations, and other activities that may constitute public disclosures, but it appears that few students are aware of these websites or directed to them by their capstone instructors. *See, e.g.*, Innovation Institute*, I.P. Facts: Public Disclosure Guidelines*, UNIV. OF PITTSBURGH https://www.innovation.pitt.edu/resource/ip-facts-public-disclosure/ (last visited Oct. 29, 2016) (providing a list of activities that may constitute a public disclosure, including "[g]iving a talk or poster presentation," sharing "any description of the invention with someone outside of the university," "[t]alking with external parties about the invention without the use of a confidentiality agreement," and "classroom presentations, including distribution of handouts."); Technology Transfer and Venture Development, *Patent Law Basics for University Researchers*, BAYLOR UNIV., http://www.baylor.edu/research/vpr/files/patentlawbasics.pdf (last visited Dec. 14, 2015) (stating that oral presentations may constitute disclosures, especially if someone in the audience is taking notes and can later prove what was said; however, the article further states that public disclosures must be enabling; and "Therefore, it is possible to have any manner of written or oral communications without defeating patentability, just so long as the details conveyed are insufficient to enable duplication of the invention."); Office of General Counsel, *Intellectual Property,* UNIV. OF MISS. INTELLECTUAL PROPERTY, http://legal.olemiss.edu/legal-issues/intellectual-property/ (last visited Oct. 29,

Schools should also take affirmative steps to preserve the confidentiality of student presentations and reports. Schools may want to consider requiring all participants in a capstone course to sign a nondisclosure agreement at the beginning of the semester. However, there are practical concerns about how to carry out such a measure and whether it would ultimately be effective. Specifically, if a student is required to participate in a capstone course in order to obtain an undergraduate degree, it is unclear whether that student can be forced to sign a nondisclosure agreement in order to enroll in the capstone.[155] Further, many capstone courses have large enrollments, and obtaining the necessary signatures and then enforcing the confidentiality obligations could be problematic.[156] At the very least, instructors should be required to inform participants that all classroom discussions, slideshow presentations, and written materials are expected to remain confidential and should not be circulated or discussed outside of the capstone course. It may be helpful to

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2016) ("[A]n idea is not considered novel if others know about it; if, for example, there has been a public disclosure. This means that presenting at a conference, writing a paper, pitching a new business, etc., can result in the loss of a potential patent if proper care is not taken."); Wyoming Research Products Center, *Disclosing Your Invention to the RPC,* UNIV. OF WYO., http://www.uwyo.edu/rpc/for-uw-inventors/invention-disclosure-uw-inventors.html (last visited Oct. 29, 2016) ("'Public disclosure' of your invention through publication, presentation at conferences, poster sessions, web site postings, classroom discussions, etc. will result in losing all rights to patenting in foreign countries.") However, the document also states that generally you may disclose your invention to fellow University of Wyoming colleagues without a written agreement of confidentiality.

[155] The question may be of particular concern for students at public universities.

[156] Capstone courses at large universities may include 100 or more students. My research has not disclosed any opinion on how many people can sign an NDA and still have it be effective. However, common sense indicates that at some point, the number becomes excessive, and the entire concept of a "nondisclosure" or "confidential disclosure" agreement becomes laughable. Further, imposing strict confidentiality obligations on capstone courses may conflict with other university interests, since many universities use their capstone programs to attract prospective students and support for research programs.

remind participants of their confidentiality obligations periodically throughout the course, such as in advance of final presentations or other sensitive discussions.

Other steps should also be taken to protect the confidential nature of student information. Capstone classes often meet in university classrooms that are capable of accommodating a large number of students. Class meetings should not be open to the public, and attendance should be closely monitored to ensure that only enrolled students, faculty members, and other authorized personnel are present. Students should be required to place "CONFIDENTIAL" markings on all reports and technical drawings they prepare, and there should be a ban on recording or photographing the presentations and materials of others. Students must not discuss their projects with anyone outside of the capstone course, and they should not allow other teams or third parties to inspect, handle, or take possession of their prototypes. They should be discouraged from publishing papers or posting videos or other materials on the Internet. Students should also be given the option of requesting private presentations with only faculty supervisors in attendance. These relatively simple steps could provide convincing evidence to any court called upon to determine whether a student's invention was accessible to the public. Implementing these types of protections will also better simulate real-world conditions, since they are measures routinely practiced by companies and entrepreneurs who are concerned with protecting valuable trade secrets.[157]

In addition, students should be permitted to opt out of public events showcasing the work of the school's capstone teams, and there should be no academic penalty to students who decline to participate. As noted above, when a school holds a public event where students demonstrate a working model of their invention and display a poster containing technical specifications and test

[157] For students who do not ultimately develop patentable inventions, these practices will still provide valuable pedagogical training for future employment, where they are expected to protect the trade secrets and confidential information of their employers.

data, it may be much more difficult to argue that the invention is not in public use or described in a printed publication.[158] Students who want to preserve the confidential nature of their projects should not be required to participate in a capstone expo, and their projects should not be featured on a school website intended to draw attention to the capstone program.

Finally, schools should find ways to make patenting resources available to capstone students who are interested in protecting and commercializing inventions. In addition to providing training on patent law and intellectual property issues, universities should attempt to make legal services available to students who wish to pursue patents. This could be accomplished in a number of ways. University technology transfer offices might be called on to provide initial patentability assessments or assist with the filing of provisional patent applications.[159] Sadly, many university technology transfer offices are understaffed, and protecting university-owned inventions created by faculty members already has them stretched beyond capacity. For those schools, asking the tech transfer office to assume responsibility for student-owned inventions would not be realistic. Law firms and legal practitioners may be willing to donate pro bono services to capstone teams. Alumni may view pro bono work as a way of giving back to their alma mater. For others, pro bono services provide training exercises for young associates, or they may assist the firm in initially attracting companies that later become paying clients as their businesses grow.

Law school intellectual property law clinics may also be able to assist with providing patentability opinions and filing provisional or non-provisional patent applications. The USPTO's Law School Clinical Certification Program gives limited recognition to law students who are enrolled in a participating law school IP clinic.

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[158] *See supra* p. 206.

[159] Even if students were expected to pay the filing fees associated with filing a patent application, under the current fee schedule a micro entity can file a provisional patent application for only $70. *See* U.S. PAT. & TRADEMARK OFF., *USPTO Fee Schedule* (OCT. 1, 2016), https://www.uspto.gov/learning-and-resources/fees-and-payment/uspto-fee-schedule (patent application filing fees).

Working under the supervision of a faculty member, students with technical backgrounds are authorized to provide patentability assessments and file and prosecute U.S. patent applications. Currently, twenty-three law schools participate in the patent program, and most charge no fees for their services.[160] The program provides valuable training opportunities for law students, and servicing engineering capstone teams would be a natural and comfortable fit.

Engineering schools may also want to consider creating multi-disciplinary capstone teams that include law students as well as engineers. Assuming appropriate supervision by a faculty member or other licensed attorney,[161] cross-campus collaborations could increase the likelihood that engineering capstone students are better able to protect their ideas and inventions. Law students could make ongoing recommendations about protection of confidentiality, and they might conduct patent searches that would allow the engineers to design products that do not read on the patent rights of others or require a license. If the law student was enrolled in a law school clinic that participates in the USPTO Law School Clinical Certification Program, he or she could also file a patent application covering the team's invention. Multi-disciplinary teams would more accurately simulate the environment of industry and professional practice and would provide a richer learning experience for both groups of students.

CONCLUSIONS

Today's engineering capstone courses encourage students to create innovative products. Students are typically required to provide weekly presentations, demonstrations, and reports to their

[160] *See* U.S. Pat. & Trademark Off., LAW SCHOOL CLINIC CERTIFICATION PROGRAM (2016), http://www.uspto.gov/learning-and-resources/ip-policy/public-information-about-practitioners/law-school-clinic-1.

[161] Although the actual requirements may vary from state to state, law student participation would require supervision by a law school faculty member or other licensed attorney. If law students were asked to provide legal advice or services without appropriate supervision, there is a danger that the student would be viewed as engaging in the unauthorized practice of law.

fellow students, course instructors, and other advisors. Every situation must be judged on its own merits, but public policy considerations weigh against treating these classroom activities as public uses or publications that could result in a loss of patent rights if an application is not filed within twelve months after such disclosure. However, if appropriate safeguards are implemented by universities and the faculty members who teach capstone courses, student inventors should have strong arguments as to why their classroom activities do not constitute prior art disclosures under U.S. law.