

LEARNING COMMONS VERSUS MAKERSPACES

by

Katherine M. Wight

An Abstract

of a research paper submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Library Science and Information Services
in the Department of Educational Leadership and Human Development
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ABSTRACT

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In recent years, learning commons and makerspaces have become important topics for school libraries in an effort to better prepare students for the demands of the 21st century. This paper reviews the definitions of each and how they overlap. The author investigated research published in peer-reviewed books, articles, and journals; and this paper is a review of that literature. Librarians that have implemented one or both of these in their school library have seen favorable results, though the research is not conclusive.

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CHAPTER 1
INTRODUCTION

A learning commons is a hub within the school that encourages collaboration, creativity, inquiry-based learning, and ownership of space (Mihailidis and Diggs 282, 289). Students and teachers need a space where they come together to read, learn, collaborate, create, share, explore, and research. The library, as a learning commons, is a hybrid configuration as it maintains the brick and mortar structure while creating an online space for solving problems (Wallace and Husid 27).

This space consists of moveable furniture and wide-open spaces. A learning commons might include designated noise zones to indicate what volume is allowed in each zone. Communication is encouraged. Learning commons are noisy, active spaces where learning is taking place.

A learning commons has a variety of materials, depending on the needs of the school community. It will always include traditional print materials such as books and online databases. It will likely include technology beyond desktop computers, including iPads, laptops, e-readers, tablets, SMARTboards, and cameras. Many learning commons include a student technology team to assist with technical questions or difficulties, similar to the Apple genius bar.

With legislation, like the 2007 America Competes Act and 2011 Reauthorization Act (Hopwood 53), and major companies, like Google putting an emphasis on STEAM (Science, Technology, Engineering, Art, and Mathematics) and creativity, schools have taken notice of the trend; thus, the makerspace was born. There has been an explosion of makerspaces across the country in libraries, museums, and schools (Loertscher 2012). Each space may look a little different depending on the needs of the community.

A school makerspace should have moveable furniture to accommodate small or large groups and projects. It should be a place for students to drop by anytime to build, tinker, ask questions, or share ideas. Thus it should be an easily accessible, exciting space.

This does not need to be overly technical. Makerspaces often start very small with Legos; exploration kits, such as fossil rubbings; craft kits; or even old computer take-a-part stations. Older students might enjoy working with electronics. If funding is available, students enjoy 3D printers and modeling software they use to create designs and print them.

There are a lot of similarities between a learning commons and makerspace, such as usage and design of space, furnishings, and technology. Both need advocates within the school community. A school library might become a learning commons with the proper funding and support and can include a makerspace in a corner or converted room.

Statement of the Problem

Students need greater exposure to science, technology, engineering, arts, and mathematics education in a safe, welcoming environment. The learning commons and makerspaces are two environments that provide those opportunities within a school library. Librarians and administrators are developing greater awareness to the needs of the school community and ways to implement these ideas and strategies into the physical and virtual space of the library.

Purpose of the Study

This study reviews the literature to better understand what learning commons and makerspaces are and how the two overlap. The literature reviews the definitions of each, ideas for space and usage, how to generate support, and how the spaces impact the community. The results of this study help readers better understand how the two spaces can be implemented in a

school library and suggest that a library can contain both a learning commons and a makerspace. First learning commons are discussed. Then the paper discusses makerspaces. The third section compares the two.

Research Questions

The purpose of this study was to better understand what learning commons and makerspaces are and how they can be implemented in a school library. The following questions helped guide my research throughout this process. The answers can be found in the literature review in chapter 2 or the conclusion in chapter 3.

1. What is a learning commons and how is it used?
2. What is a makerspace and how is it used?
3. How do the two spaces overlap?

Limitations of the Study

The limitations of this study include the time and resources available during this process. I used textbooks I own and online databases available through the James C. Kirkpatrick Library to complete my research. These are fairly new topics, so the results that were directly applicable were a bit limited. I did not find any articles comparing these two topics as I have done.

Definition of Terms

Blog: An online site that can be used privately or publicly to log things like writings, photos, and videos.

Learning commons: The hub of the school where students and teachers come to learn, create, collaborate, discover, and explore.

Podcast: A series of audio recordings often by the same voice on a certain topic.

Makerspace: A dedicated space in the library where students can invent, create, tinker, and play through a variety of tools, toys, and activities.

SMARTboard: A user-interactive whiteboard that is often connected to a PC and a wireless network.

STEAM: An acronym for science, technology, engineering, art, and mathematics.

Virtual learning commons: The online portion of the learning commons that brings the entire school together 24/7.

Webinar: An online learning experience, often a class or educational opportunity.

Wiki: A site that allows multiple users at one time to create, change, or suggest new ideas and information.

Research Design

I selected these topics due to an interest in learning more about learning commons and makerspaces in a school library. No original research was conducted. I reviewed existing literature on this topic. Articles were retrieved from the following databases: *ProQuest Central*, *ProQuest*, *Library, Information Science & Technology Abstracts with Full Text*, *Emerald Insight*, *Academic Search Complete*, *Academic Search Elite*, and *Education Research Complete*. Search terms included “makerspace” and “learning commons.” I borrowed keywords from articles I thought were useful and searched with those subjects. I also found articles referenced within other articles.

Conclusion

This study consists of three chapters related to defining and comparing learning commons and makerspaces. The next chapter is a review of the literature. The third chapter includes answers to the research questions posed in chapter one and ends with a list of references.

CHAPTER 2 REVIEW OF THE LITERATURE

Introduction

This research paper explores the differences and similarities between learning commons and makerspaces in school libraries by examining the definitions of each, and provides ideas for how they are used in schools. First learning spaces are discussed. Makerspaces are described in the second section. The third section compares the two.

Learning Commons

This section explores the learning commons in a school library. First, it discusses what a learning commons is, then why schools need them. It presents ideas for physical space and usage of the space and for designing and furnishing the learning commons. It also reviews how the space meets curriculum needs. Finally, it discusses the impact a learning commons can have on the community.

What a Learning Commons is

A learning commons is a hub within the school that encourages collaboration, creativity, inquiry-based learning, and ownership of space (Mihailidis and Diggs 282, 289). It is a commonly accessed space where students exchange ideas in pursuit of individual and academic growth (Hyman 17). The library, as a learning commons, is a hybrid configuration as it maintains the brick and mortar structure, while creating an online space for solving problems (Wallace and Husid 27). It is relaxed and inviting. It encourages all forms of the arts. It is full of new technologies and promotes technological use. Silence is no longer a mandate. Communication is welcome and encouraged. The learning commons builds upon community spirit (Mihailidis and Diggs 282, 289). It serves multiple purposes, acting as a calm, quiet place for busy brains and also provide room for growth for those seeking collaboration, exploration, and free exchange.

The learning commons has three distinct priorities: usability, flexibility, and durability (Hyman 17). It is easily accessible and usable by all members of the school community, incorporating flexible schedules and spaces to accommodate access needs, and includes durable furniture.

Why Schools Need Them

The learning commons is needed in a school library for many reasons. The learning commons is a safe haven for students, a place for them to connect to each other and the outside world, a common meeting ground, and a place for professional support for both students and staff (Kowalski E20). While the goal of a school is to improve learning and achievement for every student (Mihailidis and Diggs 282), students need a place where they can feel safe to take risks, wonder, and grow; where they can have active imaginations and be encouraged to think deeply and read widely (Hyman 19). The expectation of users is that they can go to the learning commons to explore, create, think, participate, and perhaps most importantly, take control of their own learning (Loertscher, "Self-Directed Learners" 38). The idea is for students to grow beyond traditional research and group work to a higher level of engagement through collaboration, experimentation, and exploration (Loertscher, Koechlin 20).

The movement from traditional libraries to a learning commons originated in higher education in recent decades. This was due in part to an overwhelming response from students and faculty who said they needed better facilities in their academic library as well as assistance understanding technology (Mihailidis and Diggs 281-282). A learning commons has the same crucial pieces as a traditional library (print and other physical materials, space, and technology), but allows for new experiences through different physical arrangements and ideas for use of physical and virtual space and content offerings (Stephenson and Stone 45-46; Wallace and Husid 27).

School libraries have transitioned to learning commons to meet student and staff needs and will continue to change based on the evolving needs of users. School libraries are no longer perceived as storage spaces for books or data warehouses (Mihailidis and Diggs 281-282). “A school library is a space that continues to evolve with the needs of its users. It is unique among spaces in that it impacts the entire school. No other space--and no educator other than the school librarian--touches each student every year and every day” (Turner 28). It is not just a place for consuming information. It is a place for creating, critiquing, and building experiences together (Loertscher and Marcoux 11).

Ideas for Space and Usage

Before making the transition from a school library to a learning commons, the needs of the entire school community are considered. The goal is to create a cooperative learning space. This is achieved by interviewing teachers, students, and parents to find out what they would like to see, how they might use the space, and ideas they have for fundraising (Stephenson and Stone 45, 47). If librarians limit the idea of what a school library is, they will miss out on the opportunities that a learning commons provides.

The learning commons might focus on multiple areas, such as information and media, technology, and innovation and creativity. The space ideally has wireless access for personal devices to keep students digitally connected and promotes use of online tools to enhance creativity (Mihailidis and Diggs 283). If funds are available, there will likely be a cart of laptops to be used in the library and checked out to classrooms. Using laptops to replace desktop computers opens up additional space for other activities (Ackroyd 26).

In addition to housing a library collection, the learning commons provides a lab space for creation (Mihailidis and Diggs 282-284; Stephenson and Stone 45-46). This might consist of an

art studio, technology lab, science labs, flexible work spaces with various moveable furniture, whiteboards for collaboration, SMARTboards, read-aloud areas with pillows, and sliding doors and walls to create separate spaces (Mitchell and Potvin-Schafer 17). The learning commons is suitable for holding public readings, musical performances, art, and poetry readings, as well as traditional activities such as conducting research or finding an interesting book.

Designing the Space

Designing the learning commons is fun and challenging. The process looks different from library to library. If office space is limited, the librarian and technology person might share a space, which unifies the programs and services by creating a collaborative, shared workplace. The library might have structured usage zones, such as collaborative areas, a conference room, a genius bar, laptop cart storage, an outdoors space, or printer and copier stations (Stephenson and Stone 46-47). The space might also include a production studio for live newscasts, media projects, and filming (Hyman 19). One wall could be painted to be a whiteboard or chalkboard placed out in the open or within a quiet, enclosed space. Ackroyd recommends tall shelves be eliminated, moved to one area of the library, or placed along walls in order to open up the space (26).

The space has many uses and may need zoning control, otherwise noise levels could get out of hand and students who prefer a quiet study space will feel frustrated. Turner recommends hanging signs that describes the noise level anticipated for each area. They can be color coded as red, yellow, and green (Turner 29). In the learning commons at Chelmsford High School, no rules are posted, but the staff and students exhibit respect for each other and the space by following zoning restrictions (Mihailidis and Diggs 283).

Furnishing the Space

The library furnishings tie into the design and needs of the space and will, therefore, have different components; but the key ideas are moveable, adjustable items to ensure the space is changeable depending on users' needs. Most designers of learning commons are looking for lightweight seating, tables, and fixtures that are stackable, sturdy, and easily moveable. Furniture such as wheeled bookshelves, moveable whiteboards, and flat display screens are all examples of moveable equipment. There is often a combination of hard and soft seating (Stephenson and Stone 48). This includes soft cushions for story time and balance seats to encourage activity while strengthening muscles. The new styles of seating and additional resources see immediate popularity between students, parents, and staff (Stephenson and Stone 48). Furniture is often stylish, modern, cozy, and attractive (Hyman 17). The furnishings make or break the usability and attractiveness of the library learning commons (Stephenson and Stone 48).

Virtual Learning Commons

The learning commons is a scaffold to support both formal and informal learning (Hyman 17) and achieves this, in part, through a virtual learning environment. Kowalski recommends moving magazine, newspaper, and other media consumption to an online format, rather than ordering and housing paper copies (E20). Accompanying the physical learning commons, the virtual environment helps students learn and build together online (Stephenson and Stone 45). The virtual learning commons is the digital component of the learning commons involving the entire school. Software allows for many contributors. The virtual learning commons can be as public or private as the school desires. The teacher sees the virtual learning commons as a place for collaborative learning. The student sees it as a place to find assignments, participate in clubs, find tools, and share knowledge. The librarian may use it to encourage students to participate in state book award programs, promote reading, think critically, and communicate with authors or

students at other schools. A student tech team might use it to promote new Web tools through tutorials and a virtual help desk. Older students may help younger students with assignments through a shared virtual space. The space may be used to organize tasks and meetings for teachers, students, or parents. Overall the virtual learning commons fosters a sense of ownership among its users and is a place where everyone is contributing and reaching for excellence. The portals may include an information center, a literacy center, a knowledge-building center, and an experimental learning center (Loertscher and Koechlin 20-24).

The platform of the virtual learning commons might consist of webinars, online teleconferencing, podcasts, wikis, and instant messaging (Kowalski E21). It might host an online calendar, library information, blogs, book trailers, special events, and a contact page (Turner 31; Donham 227). It might also include student-produced music from a music creation lab, teacher collaboration pages, and a shared writing space to encourage creative writing (Ackroyd 27). Digital platforms allow students' projects to have a life beyond completion, where others see them and comment on their value (Turner 31). Staff members understand that students desire a deeper digital connection, and the virtual learning commons provides that (Mitchell and Potvin-Schafer 20).

Curriculum Needs

Both the physical and virtual learning commons connect with the curriculum needs of the school. It will have far more resources than a regular classroom for teachers to use to create new opportunities when teaching existing units. The program supports project-based and inquiry-based learning with technology and builds on the culture of reading (Stephenson and Stone 45). Collaborative planning between teachers and the school librarian ensures integration of ideas and materials that support the objectives of the school.

The learning commons also impacts the school curriculum by assisting students with media literacy. For example, students learn about the ethical use of information when they learn why citing sources is part of the research process (Hyman 18-19). The library program helps students recognize the diverse stream of global information. Students learn how to navigate information and develop their own media literacy skills as they engage online with those of other communities. They will learn how to judge credibility and bias. Students may not know how to effectively navigate the Internet and find appropriate information solely because they grew up in the digital age. Students learn about the benefits and pitfalls of information published online and putting faith in that information. They will learn how to create these and other critical habits of media literacy (Mihailidis and Diggs 287-289).

Library instruction in the learning commons aligns with the Common Core State Standards (Kowalski E19). The librarian assists with Common Core reading standard goals by hosting reading partners and clubs, which gives students opportunities to discuss fiction and nonfiction literature (Calkins, Ehrenworth, and Lehman 30). Teachers post signs by their doors indicating what they are currently reading to generate interest and to show that adults also love reading. The learning commons is connected in many ways to the standards.

Connections to the entire school community might take place during events, community programs, and professional networking. When stakeholders feel that their input matters, their level of investment in the learning commons will increase (Kowalski E21). Parent volunteers help cover and shelve books and rearrange furniture when needed for events. Sometimes local businesses are willing to donate time and materials. The principal provides ideas, helps make curriculum connections between the library and classroom, and ensures funding is allocated from the budget (Ackroyd 26-27).

Teachers work with the librarian on instruction and also provide feedback on the collection (Hyman 20). Strong learning commons have involved teachers. One way to accomplish that is by beginning each year with a staff orientation to remind them what the library offers. Food and comfortable seating helps teachers relax and stay engaged (Ackroyd 26-27). Teachers also find that collaborating with the librarian promotes inquiry-based learning, which allows students to develop higher order thinking skills (Wallace and Husid 25).

Impact on the Community

Because it is student centered, the learning commons nurtures and supports students' self-motivation, self-awareness, direction, and accountability (Wallace and Husid 25). This is enhanced when students' have the opportunity to take on authentic roles. For example, students help with collection development, management, technology assistance, and promoting the facility and its activities and resources (Kowalski E21). Another example is if the learning commons sets up iStaff programs, which are similar to 'genius bars,' the help desks found at Apple stores. Any student who wants to join is eligible. Students may assist with charging devices, troubleshooting in classrooms, helping resolve technology issues, creating and promoting events, creating bulletin boards, circulating books, and shelving (Turner 30). This is a leadership experience that provides lifelong, transferable skills (Kowalski E21). Students develop self-motivation, self-awareness, direction, and accountability as members of the iStaff.

Joan Ackroyd, a librarian at Monticello High School in Virginia, described how her at risk students admitted that using studio spaces in the learning commons motivated them to attend school. Other students said they worked with kids they normally do not interact with. This might be because the space brings students together independently, rather than as a class or grade, and encourages them to work together. Ackroyd's library saw a jump in classroom and independent

student visits. She said, “At first glance appearing chaotic and noisy, further observation would show that amid the socialization, students were engaged and on task” (25-26). Student tardiness and absenteeism decreased and students confirmed that they like the learning commons and feel more engaged there (Mitchell and Potvin-Schafer 19).

Loertscher and Marcoux visited new learning commons and interviewed students and librarians about the space. They found users report a feeling that everyone owns the space, rather than one dominating librarian. As such, everyone is responsible for caring for the space where they contribute and coexist (Loertscher and Marcoux 10). None of this would be possible without the commitment of the librarian to the purposes of the learning commons (Hyman 20).

Makerspaces

This section explores a makerspace in a school library. It discusses what a makerspace is and why schools need them. Then it presents ideas for space and usage. Next it delivers ideas for designing and furnishing the space. It also details how the space aligns with the curriculum, the support that is needed, and how to gain it. Finally, it discusses the impact a makerspace has on the community.

What a Makerspace is

In 2007 President George Bush signed the America Competes Act, which called for a greater emphasis in science and math education to better prepare young people for the 21st century work force. In 2011 President Obama signed the Reauthorization Act into law (Hopwood 53). In the first White House Maker Faire in 2014, President Obama called upon people to spark creativity and encourage invention within their own communities. There has been an explosion of makerspaces across the country in libraries, museums, and schools (Loertscher 2012). These spaces happen in a variety of places including classrooms, studios, homes, and garages

(Halverson, Rosenfeld, and Sheridan 501). They are supported by government funding, projects in higher education, non-profit grants, and communities of people who consider themselves makers.

Major companies, like Google recognize the importance of designating time during the day for making. Google has an 80/20 rule for their employees. Eighty percent of their time is spent on assigned tasks, while twenty percent is spent creating, thinking, learning, or hatching new ideas. If a technology leader like Google recognizes the importance of making, it might be a sign for schools to take notice. When students get the opportunity to pursue a passion and explore the creative side of their mind, it could lead to something great (Loertscher, Preddy, and Derry 48).

It is the people who are often seen as different that change the world. Students who do not shine in academic classrooms might excel in a makerspace. Apple recognized this through one of their most notable, early slogans.

“Here's to the crazy ones. The misfits. The rebels. The trouble makers. The round pegs in the square holes. The ones who see things differently. They're not fond of rules, and they have no respect for the status quo. You can quote them, disagree with them, glorify, or vilify them. But the only thing you can't do is ignore them. Because they change things. They push the human race forward. And while some may see them as the crazy ones, we see genius. Because the people who are crazy enough to think they can change the world are the ones who do.” -Apple Think Different Campaign (qtd. in Loertscher, Preddy, and Derry 48).

A makerspace is a place that encourages thinking, learning, doing, creating, producing, and sharing. It is often associated with the science, technology, engineering, and math (STEM)

curriculum. A maker is a person who is creative, constructive, and thinks outside of the box to solve problems, invent, and help others do the same. The uTEC Maker Model (using, tinkering, experimenting, and creating) defines the stages a maker goes through to achieve creativity and new ideas. At the using stage, the user re-creates something that already exists. At the tinkering level the user begins to question how and why and fiddles with the original design. Next is the experimenting stage. At this level the user starts to abandon the original idea to create something new. There is usually more passion at this level and the user experiences failure and success. At the creating level the user is independently creating new things. Imagination is most important in this level (Loertscher, Preddy, and Derry 49-50).

Why Schools Need Them

When students learn new skills through making, they change the way they view themselves and the world around them (Buerkett 18). Curiosity has the ability to draw out students' best aspects. A makerspace is nothing without makers. An effective makerspace engages students through playfulness. It inspires students to think deeper and take ownership of their learning. This type of space allows students to think of themselves as something other than information consumers (Canino-Fluit 22). It brings out the maker in every child (Loertscher 45).

A makerspace is a community of practice constructed in a physical space, which allows individuals to move in and out of the community freely. A makerspace is a place where students stop in for brief periods of time after lunch or between classes, play, and head to class (Kurti, Kurti, and Fleming 10). The maker movement is built upon the idea of constructivism, which is hands-on learning through building. Students take control of their own learning in a makerspace, often by demonstrating entrepreneurial behavior (Loertscher, Preddy, and Derry 48). Making requires the student, rather than the teacher, to initiate learning, thus creating individuality in

making (Kurti, Kurti, and Fleming 8). In addition, makers support each other, which helps build the sense of community. Great makerspaces embrace collaboration (Kurti, Kurti, and Fleming 9, 11). Students with different learning styles collaborate on projects and teach each other new concepts. Even though students learn differently, they come to common understandings. The teacher will remain watchful from the outside. A makerspace is then an Artisan style system where the mentor might take an understudy role and vice versa (Kurti, Kurti, and Fleming 9).

Libraries have a history of being a free, open space for everyone, regardless of socioeconomic status. In the 1960's a trend developed to create a 'make and take' area in the corner of the library with phonograph records, 8-mm silent loop films, and sound filmstrips. Today those same spaces are trending, but are both physical and virtual with more advanced offerings (Loertscher 2012). Libraries are coming full circle back to the idea of making. Making is a way to bridge gaps in technology for students of varying statuses (Halverson, Rosenfeld, and Sheridan 495, 501). Makerspaces in libraries provide these same opportunities to students while enhancing the experience and opportunities provided. Activities that involve making may already be happening in the school library to some degree, but are becoming more popular with a strong driving force from the librarian and advocates (Colegrove 4).

Ideas for Space and Usage

There are numerous ideas for space and usage of a makerspace. A makerspace does not need to be complicated; it just needs to be a supportive environment that does not discourage failure. It is a place where students learn that mistakes happen, but are fixable. They will face challenges and experience growth through these obstacles. Makers often face more challenges than answers. Because of this, projects arouse curiosity even when students are not in the space

(Kurti, Kurti, Fleming 2014). For these reasons it is crucial to take student's interests into account when creating the space (Kurti, Kurti, and Fleming 9).

A makerspace in a school includes a variety of activities, such as a fabrication lab where students build things; a hackerspace where they explore the inner workings of computers and other technology; and a co-working, shared environment (Colegrove 3). The space also encourages art and design, which is the A in the acronym STEAM (Kurti, Kurti, and Fleming 8), an acronym also used to describe the learning that occurs in a makerspace. By including STEAM, the makerspace becomes a hybrid supporting arts, sciences, crafts, industrial tech, inventions, and hobbies (Loertscher, Preddy, and Derry 2013).

Each makerspace is different, and some may even include cooking, knitting, woodworking, drawing, and sewing (Canino-Fluit 24). No exact layout is required for a makerspace. Resources or specialties do not deter librarians wanting to get involved. This might include 'make and take' activities like a leaf rubbing kit; experimental stations, like 'does it sink or float;' or, if the school is near a body of water, a beach observation kit, which includes rocks, sand, maps, and a magnifying glass (Koester 22-25).

Designing the Space

The design of the space also varies depending on the needs of the community. For inquiry-based learning to occur, students must feel attracted to and inspired by the space (Kurti, Kurti, and Fleming 9). New Milford High School in New Jersey placed a large TV in their maker corner. The screens display something different each day. They show a question, quote, link, or video to inspire student inquiry (Kurti, Kurti, and Fleming 20). Makerspaces need arts and craft supplies and objects that spark creativity. The librarian invites local artists, students, and parents to bring in their own projects to display (Kurti, Kurti, and Fleming 9).

Evidence suggests that even though people think of makerspaces as technical, they may not be. The environment only needs to promote creative, innovative thinking (Kurti, Kurti, and Fleming 8). The librarian might begin with a small makerspace in a corner of the library or even a maker table (Kurti, Kurti, and Fleming 24). Some suggestions for planning a makerspace include good lighting and space, flexible furnishings, self-instruction possibilities, and digital pathfinders leading to websites on topics of interest (Houston 27). It is recommended that it is an open space with few walls. More space invites more possibilities (Kurti, Kurti, and Fleming 9).

Furnishing the Space

After the makerspace is designed, it is filled with furnishings and tools. The tools that the librarian chooses may not encompass every student's interests, but might arouse curiosity. Beginner level makerspace tools are easy to obtain and use, such as Legos, clay, magnets, photo booths, or even button making tools (Kurti, Kurti, and Fleming 9-10). One librarian suggested using Little Bits, a system of electronic pieces that snap together with magnets. Old, donated computers work well for a take-apart station. MaKey MaKey kits can be purchased. This is a beginning invention kit that turns everyday objects into a keypad (Kurti, Kurti, and Fleming 21-22).

The initial costs for resources in a makerspace might be less than \$1,000 when things are donated, like old tools and broken computers. A librarian begins a makerspace with items that already exist at home or school and builds from there (Buerkett 19). Another idea is to have a rolling cart with clear drawers filled with craft supplies (Plemons 12-13). Further down the road the librarian might be able to add more advanced items such as 3D printers that allow users to "create physical objects out of digital ideas" (Moorefield-Lang 583). Also, 2D and 3D scanners can be added, along with 3D drawing programs.

Students use many types of intermediate tools to create 3D designs compatible with 3D printers. Entry-level, easy to use 3D drawing and modeling software might include Google Sketchup for creating architectural drawings, 3DTin for drawing shapes, or 123D Creature for designing creatures. Computer aided design (CAD), modeling software is for students who are creating more complex drawings, like those used in engineering to create solid parts and objects. Artistic mesh modeling software allows students to essentially work with digital clay. 3D scanners will create a 3D model file from an object that can then be printed with a 3D printer. The 3D scanner and printer go hand in hand. Along with the ability to create 3D products, makerspaces might also include kits containing resistors, capacitors, integrated circuits, switches, and other solid-state components that students use to learn more about computing technology (Kurti, Kurti, and Fleming 11).

Curriculum Needs

The makerspace may or may not tie into the school's existing curriculum. Librarians with makerspaces in their libraries encourage their use whether that use meets specific pieces of the curriculum goals or provides intellectual enrichment (Loertscher, Preddy, and Derry 51). Plemmons, the librarian at David C. Barrow Elementary, has involved classroom curriculum in the makerspace by creating gems on the 3D printer while students are studying rocks and minerals, and by creating charms for bracelets that are sent to students in other countries. One challenge that Plemmons has with 3D printing at the elementary level is the amount of time it takes for the librarian to be involved in the process between training, supervising, and printing with students. This is an additional factor to consider when selecting resources for the makerspace (Moorefield-Lang 586).

The librarian is able to consider the makerspace trend by taking time to stay connected to the existing offerings at the school (Kurti, Kurti, and Fleming 21). *Standards for 21st Century Learners* suggests it is important to develop inquiry skills in a collaborative environment rich in tools and resources (Houston 26). Houston recommends librarians stock shelves with books and magazines about making, and offer school visits to Maker Fairs, in addition to housing their own makerspace (28). Support from the school community is necessary for a makerspace to thrive. It does not take a technical person to start a makerspace in a school (Kurti, Kurti, and Fleming 10).

Certainly schools consider liabilities that arise with potentially dangerous tools, the expertise required to use them, and how to conduct activities safely and effectively. Those which require potentially dangerous equipment have students sign waivers and user agreements, for example (Houston 27). The goal is to make the space, get the tools available to begin innovation, and resist looking into future costs until necessary (Kurti, Kurti, and Fleming 12). When the library is ready for larger items, like 3D printers, it may take a little more creativity since the district may not be willing to purchase one. Revenue can come from small funds, like book fair profits. Items might be collected through emails sent to co-workers and friends that describe needs. Support might also come in the way of volunteers, experts in the field, and from donations from larger makerspaces (Buerkett 19). Plemmons at David C. Barrow Elementary suggested programs like Donors Choose. Within 48 hours, their project was fully funded and they were able to purchase a 3D printer (Plemmons 12).

Impact on the Community

Makerspaces have a positive impact on learning communities. They lead to determination, independent, creative problem solving, and authentic experiences to prepare students for the real world (Kurti, Kurti, and Fleming 11). Students will find a deep sense of

confidence when they learn by making. The librarians at New Milford High School in New Jersey has noted that their makerspace is now a thriving environment where students stop by during their lunch for a chance to create, even if only for a few minutes. Students from different social groups outside of the makerspace are finding common ground and help each other to build projects. Students emerge as experts and share that knowledge with their peers (Kurti, Kurti, and Fleming 23). Ana Canino-Fluit started a maker club in her library and found that some students identified particular things they wanted to learn and focused on those skills, while other students are still trying to find where their interests lie and, therefore, try numerous things (Canino-Fluit 26).

Gail Brisson, a librarian and maker club sponsor at a New York elementary school said some teachers were initially uncomfortable with makerspaces because students may walk away from projects without completing them or create something completely different from the original plan; but eventually they come around to the idea that this is not failure, but rather trial and error, which is what this movement is all about. Rebecca Buerkett, an elementary librarian, requires students to prepare exit tickets, which asks them to share what they created or learned and ideas for future projects. This allows for program assessment and for students to reflect on their own learning (Buerkett 20). When students are allowed to play, invent, and create, they are taught to trust themselves (Plemmons 12).

Comparing Learning Commons and Makerspaces

This section compares how a learning commons and a makerspace overlap in a school library. This includes similar design needs for the space. It could also include physical and digital needs. Finally, it describes how ideas and creativity come from both spaces.

Design and Furnishing

A learning commons and makerspace have similar design needs. This includes opening the space as much as possible; equipment for interacting with authors or students, even those in another state; a large community coming together to raise support; or staff development to bring faculty up to speed with new technology. For example, both a learning commons and a makerspace may have coffee tables outfitted with charging stations for personal devices. They both have space for construction and creativity (Hyman 19). Some spaces are combined; such as a previous conference room within the learning commons used as the makerspace. Rooms are zoned for set purposes, such as quiet reading or a 3D printing room (Ackroyd 26, 28).

While the two can be combined into one space and may include similar structures and furnishings, typically a makerspace is messier than the learning commons. Some may see the makerspace and learning commons as related and notice the potential for their coming together to be environments where members of the community help each other (Loertscher 46). For all purposes, both the learning commons and the makerspace are open for students to use throughout the day (Ackroyd 26, 28).

Building Support

The librarian builds support for the learning commons and makerspace. The library program becomes an easy target if the school community does not see or understand its value. It is the librarian's job to make sure that the community recognizes the impact the program has on teachers and students. Teachers and administrators may need to be reminded of the potential of these programs (Woolls 189-190). A good marketing tool for librarians is to make a presentation to students and staff about what the library has to offer (Woolls 197). This presentation might include new materials, equipment, and services. Including student products in the presentation

provides additional evidence. The presentation also might touch on services that students and teachers may not be aware of as well as those that are popular (Woolls 192).

Curriculum Ties

There are many ways that the librarian promotes STEAM curriculum in both the learning commons and makerspace. This is achieved by highlighting materials in the library that already coincide with STEAM, like reference, nonfiction, magazines, and newspapers. This is also represented by book orders and by working with vendors to develop a larger STEAM collection. The librarian includes STEAM in the library orientation presentation by presenting information about the resources of the learning commons or makerspace to students and teachers and having a scavenger hunt for materials. Another way to introduce STEAM topics is by inviting guest speakers from the community to talk, share, or hold book talks or workshops in the space (Duff 24-26).

Generating Ideas

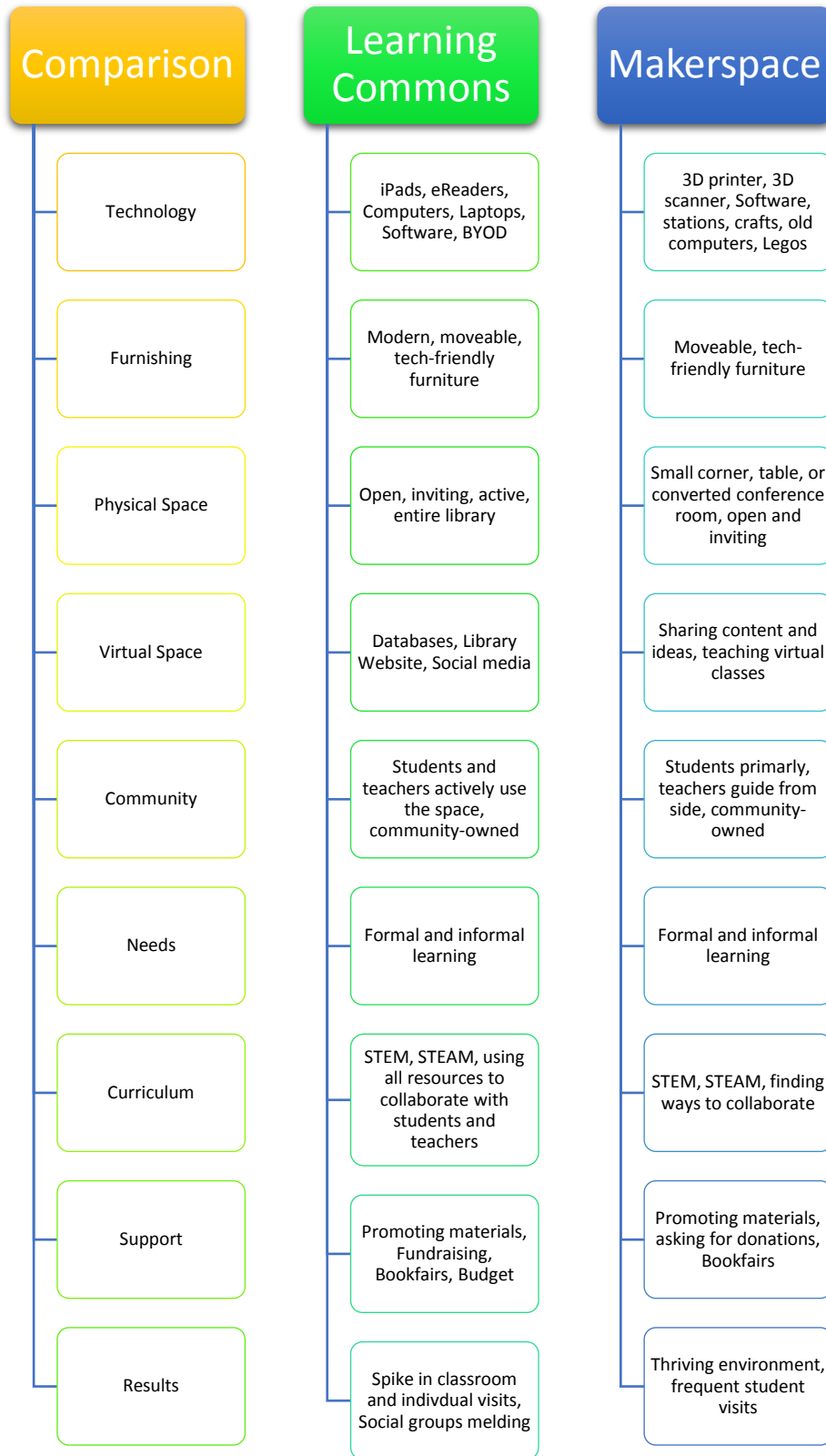
Ideas and creativity are generated in both the learning commons and makerspace. Crazy ideas are rewarded and recognized. Unsuccessful projects are represented as steps on a path to success. This is done in the physical space through displays, but also in a virtual space where both creativity and making are shared, developed, and rewarded (Loertscher, Preddy, and Derry 51). People experience pride in their work, but in these spaces they may also encounter questions that make them want to start over. Trial and error goes hand in hand with experimentation and is welcomed and promoted within the learning commons and makerspace. Curiosity leads to learning. The library, as a learning commons or makerspace, provides an opportunity for both formal and informal learning, which is unique to these spaces. Both provide activities that build students up as self-directed learners, inquirers, explorers, experimenters, and creators. This has

been the dream of what a school library is for many years and it is finally making headway (Loertscher 38).

“Imagine an environment that is constantly changing. Imagine an environment where the participants are building, creating, and participating in a massive network of dozens of databases, hundreds of wikis and websites, and thousands of message forums, literally creating a large-scale knowledge economy. Imagine an environment where participants are constantly measuring and evaluating their own performances, even if that requires them to build new tools to do it” (Thomas and Brown 106).

This environment is a learning commons and a makerspace. The figure below demonstrates the comparison between learning commons and makerspaces.

Figure 1: Comparison Chart



Conclusion

This research paper explored the differences and similarities between learning commons and makerspaces in school libraries by examining the definitions of each; the reasons for creating these spaces; ideas for designing the space and its usage; furnishing the space; ties to the curriculum; and how to gather support or funding. The paper includes a comparison of how a learning commons and makerspace overlap. While they each have their own unique qualities, there are similarities between the two. The research shows that a library can be both a learning commons and a makerspace.

CHAPTER 3 CONCLUSIONS AND RECOMMENDATIONS

Introduction

School libraries have been evolving rapidly in recent years to meet the needs of an ever changing, technological society. School librarians are responsible for ensuring students are well read, technology savvy users of information to prepare them to be media literate, digital citizens. The physical and digital library space is changing to adapt to the changes in the way information is accessed and used. Possible components of this change are a learning commons or makerspace. This chapter will address three questions addressed in the literature review: What is a learning commons? What is a makerspace? How do the two spaces overlap?

Learning Commons

The learning commons is the hub of the school. It encourages a safe, relaxed, inviting, space where students collaborate, learn, read, inquire, grow, and create. Communication is welcome. The learning commons is not necessarily a quiet place. It has the same aspects of a traditional library including physical materials, space, learning, and technology, but allows for new experiences through a focus on flexibility in the physical and virtual space. It is a common meeting ground for students with an end goal of higher level thinking through collaboration, experimentation, and exploration.

The learning commons strives to meet the needs of its users by evolving the space and offerings. The users' goal is to stay current on modern technological trends. Students and teachers go to the library to learn about new information resources and tools and how to apply them to their learning. The librarian reaches out to the school community for suggestions on what they would like to see in the library and how they might use the space. The librarian attends

professional development workshops and trainings to learn new trends and bring them back to the space. The learning commons is the technological base for the school.

The use of space varies depending on what the community needs. The learning commons may have designated usage zones that indicate which areas are quiet and which are noisy. It may also include collaboration spaces, a genius bar, a film production area, and a whiteboard wall. The furniture is durable, attractive, and moveable. New furniture often brings immediate popularity to the space. The space supports the needs of the school community. The learning commons will have more resources than a regular classroom and can teach students media literacy skills.

The learning commons has shown an increase in library visits and usage by students and teachers in some cases. It provides an opportunity for different groups to come together to use the space and work together. What may appear chaotic is actually excited learning taking place in a space that was once quiet and where activities were pre-defined.

Makerspace

STEM and STEAM are the topics that fuel the makerspace. Powerful leaders and major companies are beginning to recognize and promote the importance of creating and inventing. Schools have taken notice and are jumping aboard the makerspace trend. A makerspace encourages thinking, learning, creating, producing, tinkering, and sharing. Students learn how to ask questions, try new things, accept failures, recreate, invent, and produce. A makerspace involves hands-on, student-led learning. Teachers take a mentor role and watch from the side. This promotes free, innovative thinking and encourages problem solving.

A school makerspace includes a variety of things. It is a hybrid, supporting arts, sciences, crafts, industrial tech, inventions, and hobbies. It includes things that students are interested in,

so will vary depending on the needs and desires of the school community. It does not need to be overly technical. The space could be as simple as supporting activities like leaf rubbings; experimental stations, like whether items sink or float; and touch stations to explore items like rocks, fossils, and feathers. Some beginning spaces include simple tools such as Legos, clay, magnets, photo booths, button making, and craft supplies. Some school librarians ask for old computer donations and let students tear them apart to see how they were made and what is inside. More advanced spaces might include 3D printers and 3D scanners along with advanced software.

Makerspaces are giving students real world skills like determination, innovation, problem solving, and independent thinking. Students are enjoying these spaces so much that they are stopping by during their lunch breaks and in between classes. Different social groups come together in the space and work together and share their knowledge. Some students are sharing their skills through student led classes. In a makerspace students learn that failure is not a bad thing. The process is merely trial and error and you try until you find success.

How a Learning Commons and Makerspace Overlap

Although a learning commons and makerspace are different spaces, they share a lot of commonalities. They have similar design needs both physically and digitally. Both may include adjustable physical space and technology-focused, moveable furniture. Both spaces are used to bring the school community together to offer a creative, innovative, team-building atmosphere.

Librarians in both spaces promote their offerings to students and teachers and work to intertwine their resources with the curriculum. A good way to promote both environments is to present to students and staff about new materials, equipment, and services that are offered in the spaces. School library programs are not an easy target for elimination in times of budget cuts if

there are understanding, knowledgeable advocates in the school community. The librarian works with teachers to find ways that the resources complement the curriculum and particularly promote these activities.

The ideas generated in both spaces are shared in the physical space through displays or virtually through a secure web space. These spaces are unique in that they offer both formal and informal learning. They teach students to be self-directed learners, inquirers, explorers, experimenters, and creators. The school library can contain both a learning commons and a makerspace.

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