How First-Year Students Navigate the Stacks

Implications for Improving Wayfinding

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First-year undergraduate students frequently encounter navigation problems in locating known items in the library. This study follows students through the library collection after they have a call number to uncover attributes of building layout that aid navigation and identify fail points. Researchers used ethnographic methodologies of interviewing, observation, and a "think-aloud protocol" to understand the first-year student's conceptual frame in navigating library collections.

Providing assistance in the search for books and other resources in the physical library space is a foundational library service. This search can be fostered or hindered by library layout. Library layout facilitates wayfinding through signs, stacks arrangement, service points, furniture, computer and other library technology placement, study rooms, and even lighting. These attributes can contribute to a compelling and valuable experience for the user in the library when done well, or produce an array of fail points when done poorly.

Building orientation is not a new problem to librarians or other professions. Architects have an interest in building navigation with a specific focus on understanding what contributes the sense of being lost in a building.[1] In a study on route uncertainty in locating books, Gale Eaton[2] suggests that the domain of cognitive psychology is useful for insights to the understanding of the human mind in the process of navigation within a building.[3] The present study seeks to surface the thought processes of first-year undergraduate students as they navigate an unknown environment. This thought process can be examined through the use of a think-aloud protocol, where students are asked to share their cognitive process as they navigate the book stacks in the library. Though all librarians know that call numbers confuse new undergraduate students—it is not precisely known how students conceptualize the search for books in the library after they have a call number in hand. The value of this research is to uncover the conceptual frame of the first-year undergraduate student and to draw recommendations for building layout such that navigation to known items may be made more amenable to the new undergraduate students as they search for resources in the building.

Recent library user experience literature[4] points to the need to understand touch points of the user in the library—which is to say any interaction the user has with library service. We are essentially concerned with the user experience of the space in the undergraduate library

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building. This research is a qualitative examination of navigation within the physical library space. Circulation data and gate counts tell a partial (and quantitative) view of the in-person experience—but numerical data does not in itself present the story as we truly want to understand it. The in-person library experience as a phenomenon for study cannot be reduced to numerical data, since the story to be told is one of attending to individual experience in the navigation of resources in the library. The research question explored here is two pronged:

- What exactly helps students find items in the library, and
- What are the fail points in navigating to the location of books on the shelf after they have a call number?

Computer science researchers in robotics and ubiquitous technologies have constructed prototype in-building navigation systems for mobile computing devices.[5] A currently implemented non-library use for positioning a device in a building are applications for use in shopping malls and airports that guide users to locations that are of immediate interest.[6] As an example of using basic research to inform mobile wayfinding systems, consider the possibility of making an application for mobile computing devices informed by the ways in which students authentically search for items on the shelf. For such a new area of service delivery to be successful and used by students, it must be informed by a basic understanding of what students really need while searching for books.[7] Such a system should respond to the ways in which students actually find items on shelves. This research uncovers requirements for future mobile wayfinding applications.

LITERATURE REVIEW: ETHNOGRAPHIC METHODS IN THE STUDY OF STUDENTS

A common thread in the literature of studying students is the use of ethnographic methodologies (detailed observation techniques[8]) that stem from cultural anthropology; research is considered ethnography when it "focuses on studying the behaviors, beliefs, and experiences of a specific group in order to describe and define that culture."[9] A national qualitative approach utilizing discussion groups as a means for studying how the contemporary undergraduate student conducts academic research is presented in the *Project Information Literacy Report*.[10] This report seeks to understand the characteristics of research in the digital age. As a startling and counterintuitive finding, the Information Literacy Report found— "Research seems to be far more difficult to conduct in the digital age than it did in previous times."[11] The authors go on to note, "Participants in our sessions reported almost twice as many frustrations, overall, with conducting course-related research than with everyday life research, though the nature or type of participants' frustrations had underlying similarities. Nine out of 15 (60 percent) of the frustrations students reported for course-related research had to do with an inability with finding the desired materials. Similarly, 5 out of 8 (63 percent) of the frustrations participants reported involved locating research materials"[12]

Of special interest to our question at hand is the difficulty with locating material—the report then defines typologies of *context*, and the importance of *context finding* for undergraduate students.[13] The notion of context emerged as an important theme in the present wayfinding study. We found students who "did not even know where to start" when confronted with a call number. Head and Eisenberg note, "we have identified four types of context that students reported they tried to obtain during the research process. In order to undertake research, students may seek (to various degrees) the following contexts:

- Big picture
- Language
- Situational
- Information Gathering"[14]

"In light of the context typology, students value libraries for giving them the *information-gathering context* that they need to carry out course-related research. We found students valued libraries, and librarians, especially in assisting them with their strategies for retrieving "citable stuff" and for helping them navigate complex information spaces, especially on larger campuses."[15] In our discussion, we consider the attributes associated with the undergraduate student's information gathering context, and the significance of context finding in the navigation of library collections.

A related approach to understanding the research needs of undergraduate students in the digital era is the *Ethnographic Research in Illinois Academic Libraries Project* (ERIAL). ERIAL used a mixed methods research ethnographic design (data analysis inclusive of interviews, photo journals, student mapping diaries, research paper retrospective interviews, etc.)[16] to understand how students view the research process. A recent presentation by researchers from this group articulates two broad questions that ethnographic methods explored:

1. "What do students really do when they are assigned research projects for class?"
2. "What expectations do students, teaching faculty, and librarian have of one another for the student research process?"[17]

The presentation relates how a first-year student finds a video in the library: we are shown that this student was initially confused by call number classification, then building layout, followed by incorrect answers at a variety of specialized help desks, as well as being perplexed with signs in the library. It took the new student 10 minutes to locate a video in the library. The student went to three different service desks, and came back to the circulation desk after she was initially given incorrect information. In studying the student perspective of locating videos in the library, we can see the value of ethnographic research (specifically, the detailed observation)

in uncovering specific library fail points as well as implications for improving the user experience.[18]

Contemporary ethnographic research studies in libraries can be traced back to the seminal Rochester Study: *The Undergraduate Research Project at the University of Rochester.* It was the Rochester Study in which the central question was posed: "What do students really do when they write research papers?" This research could not point to one way that all students researched or even archetypes to propose. Authors of the Rochester Study simply reported a sample of different undergraduate students. With each individual there exist differing learning styles and motivations toward academics.[19] Foster and Gibbons noted also that regardless of any given librarian's college experience, the one constant we can be assured of is that the first-year student's experience will not resemble the librarian's.[20] We want to acknowledge by undertaking this research that the frame librarians bring to the information search process in the library will not match the conceptual frame that the diverse array of perspectives from new students will bring to bear on the navigation of library shelves. It is individual student's frame of reference that the present study seeks to surface.

Eaton, Vocino, and Taylor administered surveys to patrons in the library as one way to understand what helps people find items.[21] They begin by reviewing what previous studies of wayfinding assert as contributing to successful navigation:

- simple arrangement of a building
- "visual access, or open lines of sight"
- "lack of visual clutter."

In their study of those attributes which lead to success or failure in book searching "memory was apparently the most valuable aid; 436 claimed it was helpful, while only 18 found it unhelpful or confusing and 65 did not use it. Signs in general were helpful to 296 of those who reported, unhelpful or confusing to 49, and unused by 135; labels (such as "Reference") were helpful to 218, unhelpful or confusing to 51, and unused by 154."[22] In an analysis of correlations between success and perceived usefulness of signs, researchers wondered if "signs work better as reminders to users who are already familiar with the territory than as finding aids to new users?"[23]

Eaton relates one definition of route uncertainty as "calculated from the number and complexity of choices a wayfinder makes along a route. Wherever the route branches, the wayfinder must make a decision. The amount of information processed in support of the decision is influenced by the number of paths available. Assuming that all choices are equally probably, a wayfinder would have to process one bit of information at a two-way intersection, 1.585 bits at a three way intersection, and two bits at a four-way intersection. The uncertainty associated with a route can be expressed as the sum of the information processed at each choice point on the route."[24] Examining the method of Eaton's route uncertainty research,[25] we can see that this study was empirically grounded; the study began with a hypothesis that was then tested by timed book searches. Student routes to books on shelves were recorded. The study hypothesized that complexity in a building would contribute to route uncertainly; however, the results did not support the hypothesis that route uncertainty would predict "speed or directness of book searches."[26]

Other possible approaches to gathering information on how students research in libraries include focus groups and interviews as in Shenton and Dixon's study of public library users locating books in a building; they coded the results for typologies of information seeking behavior in the library.[27] Our study also coded for typologies in a similar manner to uncover aggregate trends of successes and fail points in finding items.

Larsen and Tatarka report on the crucial iterative step in observational wayfinding study: the changes made in the library as a result of assessment of the library space. Their study led to redesign of stacks maps and signage in the stacks at the University of Chicago Library.[28] Changes made to the Undergraduate Library at the University of Illinois as a result of this study are reported in the discussion.

METHOD OF THE PRESENT WAYFINDING STUDY

The research began by first recruiting students through flyers in University residence halls; students were directed to contact librarians leading this study if they were interested in participating. The students then set up a time to come into the Undergraduate Library to participate. For participating in the study students were given a gift card to the library café. Once in the library the students were given a list of three call numbers to locate. The Undergraduate Library uses Dewey classification. All students had call numbers from the same area in the library to locate. Students were instructed to use any help tools in the library they would normally consult while looking for books. We included the staff in the universe of study as well—if students chose to, they were allowed to ask library staff for help, since this is how users may authentically navigate the space.

All items students were to locate were on the lower level of the Undergraduate Library. The lower level of the library does not have a service point; all service desks at the time of this study existed on the upper level. The items students were to locate were in the same three areas for all participants. The items included one DVD and two books. One of the books to locate was shelved in the oversize area. Format types of the lower level include books, DVDs, VHS, a collection of video games (PS3, Wii, etc.), as well as books on CD and other sound files on CD and a laserdisc collection. We list all format types simply to illustrate the variety of collections housed on a single level. Also important to underscore is the nature of the media collection: it is not a collection only of DVDs but rather students are confronted with a variety of media types when looking for DVDs.

This study recruited first-year students at the University of Illinois at Urbana-Champaign. It was a requirement of participants that they be undergraduate students in their first

Table 1. Identified Navigation Fail Points from Protocol (from 16 think-aloud participants)

Navigation Fail Point	Think-Aloud Occurrences
Library classification	16
Arrangement of stacks	15
Shelf arrangement	5
Starting point	4
Erroneous interpretation of knowledge	4
Cutter numbers	3
No prior knowledge	3
Format	2
Library labels	1

Table 2. Identified Successful Navigation from Protocol (from 16 think-aloud participants)

Navigation Success	Think-Aloud Occurrences
Sign	26
Asking staff	22
Library classification	21
Shelf arrangement	13
Applies new knowledge	11
Prior knowledge	8
Arrangement of stacks	3
Map	3
Format	1

year at the university. By recruiting only first-year students we sought to understand what students new to the space would utilize for wayfinding. It may be the case that students in their final years of undergraduate study have never used the library but a study sample of first-year students will have a higher probability of students new to the space. The study began in September 2009 and the last participants were observed and interviewed in April 2010.

Three sets of data were collected in this study. Researchers recorded the students' verbalized thought processes as they navigated the stacks in the Undergraduate Library. The students were instructed to share aloud anything in the library they were using to help them locate the book. These comments were recorded and analyzed. Researchers kept observation notes (in the form of investigator logs) about help tools that students used to locate items, and finally, collected data in the form of a debriefing interview. These qualitative data help to triangulate a picture of navigation success and fail points in the search for items on the library shelf.

RESULTS

Researchers developed a coding schema based on all think-aloud items that were verbalized as ways to find items on the shelf. Appendixes A and B detail the coding schema used to code the recorded undergraduate students' think-aloud protocol. For fail points these included library classification, arrangement of stacks, starting point, format, cutter numbers, no prior knowledge, library labels, shelf arrangement, and erroneous interpretation of knowledge. For successful library navigation, the items were coded as sign, library classification, asking staff, format, prior knowledge, map, application of knowledge, shelf arrangement, and arrangement of stacks.

As can be seen in table 1, library classification and the arrangement of stacks were the most frequently occurring navigation fail points. Also observed in some frequency was the perception among students that arrangement of items on shelves contributes to navigation failure.

Table 2 tells us that students relied heavily on using existing signs in the library as well as asking library staff to successfully navigate the stacks. Curiously, both shelf arrangement and library classification emerge as frequently used tools for successful navigation.

Investigators used logs to note all wayfinding tools that they observed students using as they navigated the lower level in the Undergraduate Library. The investigator logs were coded by wayfinding tool used. Tools which students used while finding their way to items on the shelf included the following: shelf end caps; items on shelf (books or DVDs that provide context to shelf arrangement); signs; title of books; asking staff; computer; map; prior knowledge of the collection; shelf labels; format type of the item; genre type of the item.

Table 3 shows the results of coding each observed usage of the finding tools. The most frequently used tools observed by researchers include the end caps of shelves, the items on the shelves, signs in the library, and call numbers on books. Table 3 indicates also the less frequently used tools: using the computers in the library for help in finding their way, asking staff, reading labels on the shelves, navigating by format, title, using library maps, prior knowledge of the space, and using genre to navigate.

After locating the three items in the library students were asked the following three debriefing questions:

- What would have helped you find items easier?
- What was the most challenging part of finding items?
- What helped you to locate items?

Table 4 indicates the most frequently articulated themes in the debriefing interviews. Since students were able to ask the librarian for assistance, it is not wholly surprising that among the tools that helped, asking staff was most frequently mentioned.

Overall, most participants reported finding call numbers confusing, especially when dealing with media such as DVDs, and they indicated that logical arrangement of the stacks would help to find media items. Some expressed a desire to learn more about call number meanings. Participants suggested that they would like an explanation of what call numbers meant. Using call numbers for media, such as DVDs, was very confusing to participants. Five participants thought a different system of organization, either by genre and/or in

Table 3. Investigator Log

Observed Wayfinding Technique	Times Recorded
End caps of shelves	47
Using items on the shelf	35
Signs	16
Call number on books	10
Computer	6
Asking staff	4
Shelf labels	3
Format	3
Title of books	2
Maps	2
Prior knowledge	2
Genre	1

Table 4 . Thematic Results of Debriefing Interview

Student Feedback	Mentions
Librarians are helpful	4
Bigger signs when new call numbers start, here are 100s	3
Want DVDS in alpha order, not call #s	3
Call #s confusing, make them easier to understand	2
Physical set up of shelves confusing, hard to follow	2
Shelve DVDs by genre	2
More signs	2
You are here map	1
More maps, small and large	1
Shelf ends helpful	1
Librarians and staff should be more identifiable	1

alphabetical order, would be more effective for finding the materials. While call numbers organize by genre, the actual use of call numbers puzzled users. And although the DVD section of this particular library provided three categorical signs translating call numbers into genre, only a few students noted this. Even when students noted these signs they did not appear to assist them. No student mentioned them as helpful.

Participants did not always mention resources most used when asked what helped them most during the exercise. Although participants were observed using shelf end caps 47 times during the overall study, only one participant mentioned using end caps of shelves during the debriefing.

The majority of participants who utilized staff to help them locate items mentioned them specifically as helpful. It may be that library staff are memorable to students in a way that objects are not. One student did mention the need to make librarians and other staff more identifiable in the stacks. It is also worth noting participants asked for assistance from staff who were close at hand.

While there are maps and signage in the library in which the study was conducted, participants expressed a desire for more maps and more signs. They were more specific in how to make signs and maps more useful. Three participants noted that large signs conveying when new call numbers began would help, especially when shelves were physically arranged in confusing ways or to accommodate odd spaces. Two participants thought numerous "You are here" maps arranged throughout the stacks would assist finding items or other building resources. A smaller number of participants also noted that providing handouts of detailed collection maps throughout the library would be helpful.

DISCUSSION

Paradoxically, library classification exists both as a navigation fail point (16 occurrences in the think-aloud protocol—table 1) and also is the major way in which students find navigation success (21 occurrences in think-aloud protocol—table 2). Call numbers can either confuse or guide students to books depending on the student's familiarity or unfamiliarity with call numbers. The attribute for what may operationalize either phenomenon is what Head and Eisenberg underscore as significant for understanding student research in the digital era: information-gathering context.[29]

Call number classification confuses students when they do not have the context and frame of reference whereby they can apply this number as corresponding to the location of a book on a shelf. "What does the number stand for?" students asked. Students asked for signs that might explain the sections of the library. Such a question hints at what classification does—classification organizes a library and does explicitly produce these desired "library sections." Classification is a fail point in navigation when students cannot fit the number into a schema of library layout.

Alternatively, library classification is helpful in the form of a call number when students comprehend and find a context for the call number. Since all students who participated in this study were new to the university we can infer that all new students do not start from a common baseline of knowledge. This is the same thematic cadence from the Rochester Study of Undergraduate students.[30] Some students are able to locate context for their navigation by bringing previous knowledge of libraries to bear on their navigation. Since Dewey classification is a common use of organization in public libraries, and our library at the time of this study was Dewey classified, it would be those students who had previous library experience who were able to apply a schema that helped them locate items.

As a fix to this confusion over the meaning of call numbers the Undergraduate Library is now outfitted with posters that display the number and then associate that number with a broad subject. These posters help to make the library more accessible to the first-year student who is in the process of context seeking. At the same time, we still recognize there is no silver bullet that will solve all wayfinding dilemmas. Even when helpful signage exists, students frequently bypass them, since it may not be apparent that these sources would help.

In comparing the investigator logs (table 3) with thematic responses to the objects in the library that students report as helping (table 4) we can see that students are not always aware of the tools they use in navigating the library.

As an example we know that students looked at the end caps of shelves, yet did not mention this in the debriefing. Either this wasn't helpful to them, or they didn't think to announce this as a help tool. Table 3 is interesting in that it shows how librarians observe students searching for items: students looked often at end caps of shelves and then also used other books (this navigation technique occurring 35 times by 16 students) that were not the book they were looking for as a way to create context to their search in the book stacks. This may help explain why research is so difficult for students in the digital era. The digital universe does not heavily feature collocation of items in the same way that print collections can. While there is an order to the digital world, and many digital library projects certainly support elements of collocation, it does not mimic the order of serendipitous discovery that print collections support. The move to "all-digital collections" should bear in mind what will be lost—in some ways what is already lost—by moving away from the print collection. Consideration should be given to the needs of those students who will be increasingly disoriented in information environments that do not replicate aids to context finding.

Fail points of navigation within the media collection were immediately addressed at the Undergraduate Library. An investigation into categorization of DVDs began as a result of this study. It was found to be untenable to re-categorize the media collection. Analyzing the media navigation experience of the Undergraduate Library reminded us of all stakeholders of the collection. Faculty and staff have a need to locate exact items by call number. Dewey classification is important as an inventory tool. This inventory attribute would be lost if we moved toward a strictly genre based collection, since it may not be known what genre a given item may exist within. While it is not necessary to teach all users Dewey Classification ranges, a simple solution to the confusion of most students is to make clear what the categories are that correspond to the ranges. An alternative course was to label the DVD shelves in a way that indicates the broad categories of the genres. These categories correspond with the Dewey classes of the media collection.

We can see trends in the data (from different measures; tables 3 and 4) that signs are important since both investigators observed students looking at signs in wayfinding, and also students asked that there be more signage to help. The problem that may arise from the signage data are: where is the threshold for too many signs? At what point in the navigation process does signage take away from the experience of navigation since not all areas of the library can reasonably be covered with signs and as is mentioned in the literature, visual clutter is to be avoided.[31]

CONCLUSION

In applying what we have learned, the following general strategies may be used for assisting patron wayfinding in library book stacks:

Easily Identifiable Sources of Help

Staff members should be positioned where students are likely to encounter fail points. Signs in the library should identify sources of help in an inviting way. We noticed there were students who didn't view library staff as immediately helpful for a variety of reasons. Students usually used staff for assistance when told they could. What libraries could do to alleviate this finding is to make library staff more accessible as a resource to users. For example, train shelvers to ask patrons in the stacks if they need help finding items. If staffing and space allow, consider a reference "outpost" in or near the stacks. Busy staff could still complete work while being physically available to users. Staff should wear identifiers that are easy for patrons to see. While students depended on signs to find materials, they depended also on personal contact of staff as a navigation resource. Concluding patron interactions with an invitation to provide assistance in locating physical items can help students see staff as helpful for basic wayfinding help.

A Logical Starting Point Helps

If classification and library heavy meaning structure your library layout, this will confuse new users. Our new library patron that wanted to navigate by genre is essentially using a bookstore model in attempting to understand stacks layout.

Uniformity in Signage

Students noted that not all the call number numbers look the same—this was confusing, since they wondered why some call numbers seemed to be of a different type. Where possible all end caps should also be uniform in size and font—most libraries would do well to increase the size of their end cap signs since this was the primary way new users approached navigation in the library. Visual consistency across signs and help tools will aid new user wayfinding.

Future Work

We began this study to further understand what the basic picture of student navigation in the library space looks like. It is the intention of this research to help us specify functional requirements for library wayfinding systems. While traditional systems such as end caps on shelves and hanging signs will most likely not go away, we sought here to understand how emerging technologies like application phones and tablet computers may also help students find their way from call number to the location of the book on a shelf. Prototype systems for mobile wayfinding can be developed with the features students thought to be important as they were navigating stacks.

The actual performance of the application would be a dynamic a real-time path suggestion tool. The wireless infrastructures of a building would support the student in locating their position in the library building and the backend of the system would be able to map a route from the student's current

position to the shelf range that contains the book the student is looking to obtain. An applied digital library research method for creating such a tool is detailed in a separate article.[32]

We know that students prefer to look for maps; they feel maps would be helpful in situating themselves in a building. Having maps at every cross section in the library may not be feasible, but providing maps to a user's mobile device by way of WiFi or other data infrastructures is an area for further applied research. If maps are to be made for the student mobile device an explanation of the layout of the library should be simply provided, since students (by table 1) say that the library layout itself is confusing in navigation.

Future wayfinding systems should also include these preferences for general wayfinding: signs which explain layout; signs that help to explain a call number; and signs in strategically placed areas, i.e. in those points of the library that do not lend themselves to logical flow. If we take those areas as targets for help tools, then the applications are able to anticipate student fail points in the library. Anticipated fail points of navigation include areas where the logical flow of stacks may be broken due to building layout or building overcrowding: locations that do not feature service points; and moving from general direction finding to more granular locations, like the specific column and then row of books on a shelf. Mobile software could be designed for these waypoints in navigating to the location of books. This is essentially the process of finding a starting point and moving toward increasing levels of individualized specificity: the broad shelf range, to the actual shelf, to the column of books, to the item.

Further requirements for wayfinding systems in libraries need to provide a mechanism whereby students can ask for immediate assistance. Since this is not a quantitative study, it was not a focus of our research to investigate how many students actually found books; nearly all participants located all items they were assigned. In part this success rests in having help guides nearby (library staff). If there is any fundamental lesson to be learned about in-building navigation it is that the presence of staff near where students need help is crucial for them to create a context for which to begin their research. Some students began the study having no idea where to start. We cannot depend wholly on signage systems with no human component to direct students in the library, as signs cannot compensate for the students lack of prior knowledge. Assistance that is responsive to individual information seeking context is the most useful library help for new first-year undergraduate students.

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APPENDIX A. CODING THEMES OF FAIL POINTS IN LIBRARY NAVIGATION

Navigation Fail Point	Definition	Example
Library classification	The call number on the book or call number in hand does not contribute to the student locating the item.	Call number does not make sense
Arrangement of stacks	The layout of stacks is not logical to the student; the student does not interpret the stacks layout as progressing in an ordinal way.	Physical arrangement is confusing
Starting point	Does the student know where to start looking for items?	Not sure where to start
Format	Refers to Media items: DVD, VHS, Laserdisc.	Format is confusing
Cutter numbers	The cutter number does not contribute to navigating to the book; it does not correspond to a navigational or directional answer for the student.	How does the bottom number work?
No prior knowledge	There is a gap between what is needed to navigate the collection and what the student knows about finding items in a library.	Did not know there was a Q. section (the location of Oversized Books).
Library labels	The labels on DVDs are not visible. Call number labels on books are not visible.	Call numbers not viewable from student perspective
Shelf arrangement	The arrangement of books on shelf does not contribute to navigating to the item. Students not able to infer logical arrangement of call numbers of books on shelf.	Is it going alphabetically?
Erroneous interpretation of knowledge	Students ask questions of staff and seem to inappropriately apply new knowledge; directions misunderstood, or incompletely understood.	Misunderstands staff directions

APPENDIX B. CODING THEMES OF SUCCESSFUL LIBRARY NAVIGATION

Navigation Success	Definition	Example
Sign	Encompasses the end caps of shelves; signs hanging from ceiling; signs attached to walls, and signs on end of stacks	Seeing call numbers on ends of shelves
Library classification	The call number in hand makes sense to the student; the student comprehends the call number as corresponding to location of the books on the shelves; student is able to infer position based on numbers nearest to them.	Noticing numbers going up
Asking staff	Student asks staff for help in locating item; questions are about various sections of the library; and basic call number order	Asking a librarian
Format	DVD area is familiar; students knowledge of the location of item formats contribute to navigation of the stacks	Knowledge of format
Prior knowledge	Student's knowledge of the specific library building helps to guide them to location of items.	Student knows location of DVD section
Map	A map of the locations of call number ranges is located at the entrance of the lower level of the library—students consulting map are aided in their navigation to items.	Map of library
Applies new knowledge	New knowledge contributes to locating items in the stacks.	Figures out how Q. section works by using new knowledge about call numbers
Shelf arrangement	Student is able to infer a logical arrangement of books on the shelf; this aids the student in navigating to the location of the item.	Understands where to find range of call numbers
Arrangement of stacks	Student is able to infer a logical arrangement of the stacks; each range of stacks is logically positioned in an ordinal way—this aides in navigating to the location of items.	Understands how stacks continue in another location