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Integrated instruction framework for information literacy

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Abstract

In response to a college required programme review, the Portland Community College Library undertook a case study of its information literacy (IL) programme in order to understand and illustrate clearly how the programme addressed levels of IL competencies throughout the curriculum. Content and qualitative analysis were used in reviewing curriculum documents to identify emergent patterns of IL skills and concepts within the college disciplines and certificate programmes. Analysis of the college's course outcomes revealed distinct differences as well as trends across the curriculum for faculty expectations of information conceptualisation, information seeking strategies and research methods. Following this analysis, a Research Support Framework was devised as a template for guiding lower division undergraduate students' progression through several cognitive domains of IL. Course Specific Research Support Forms were created to map, in specific detail, how library instructional objectives match up with individual course outcomes as well as with the college core outcomes. Combining a critical thinking taxonomy with a continuum of skills, progressing from pre-college level readiness towards academic literacy, generated a developmental approach to IL instruction. This also illustrated the necessary preliminary steps for students' progression and knowledge gaps which may frequently arise and must be resolved before further progression is possible. Discussions between librarians and content faculty are now supported with a much more precise view of what is developmentally appropriate IL instruction for particular courses. The framework is especially applicable to students in their first two years of college. The unique situation of American community colleges means that first-year seminars are not usually possible, and the curriculum can often be as much vocational as academic. This versatile and developmental approach to IL instruction ensures the embedding of IL throughout the curriculum, providing students various and cumulative learning experiences. It will also encourage leading discussions with four-year colleges about alignment and realistic IL targets for students who intend to transfer for completion of their baccalaureate degrees.

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Keywords

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1. Introduction

This is a case study about how a model for a developmental approach to IL was initiated at a large American undergraduate institution (see the appended glossary for terms unique to community colleges in the United States). Portland Community College (PCC) has over 32,300

(full-time equivalent) students currently enrolled. Many students attend part time, making the total head count over 92,000. Four campuses and multiple centres comprise the college district, which encompasses an area of 1,500 square miles around metropolitan Portland, Oregon. It is a publicly funded, non-profit institution, with the dual purpose of providing occupational certification and initial two-year academic degrees transferable for completion at four-year universities (Portland Community College 2012, p. iv.) Three library facilities – a fourth is to be built in 2014 – are administered as a 'district' – that is, a centralised service – and are known together as 'the Library'. The Library Director supervises the Access Services Manager, the Technology Services Manager, the Web Services Librarian (a manager position) and the librarians at each campus. Each campus library has an Access Services Supervisor who functions as the facility manager and also supervises Access Services staff. The Library is under the auspices of the Vice President for Academic and Student Affairs.

Librarians at PCC have master's degrees in library or information science. They are considered faculty, with teaching responsibilities in terms of in-class library instruction sessions, occasional sections of a one-credit course on library research (LIB 101) and one-to-one instruction at the reference desks. One librarian serves as the faculty department chair, another as the subject area curriculum chair. For the librarians, teaching or training experience is required prior to being employed. Teaching excellence is supported through mentoring and professional development opportunities like conferences and at workshops through the campus Teaching/Learning Centers.

By serving on college-wide committees – among these, curriculum development and learning assessment – as well as on learning communities and teams, librarians at PCC are positioned to ensure that the IL programming they develop and the learning tools that they provide are current and directly tied to the college curriculum. Given the number of students entering and exiting at various points of academic preparedness (enrollment at PCC is open for most degrees and certificates year round), setting up a freshman seminar or first-year experience model for IL introduction would be nearly impossible. Instead, the librarians use the Research Support Framework to collaborate with instructors to devise how best to align concepts and skills throughout the curriculum.

2. Development timeline

In 1999, PCC began to provide training on how to move from a content- or competency-based approach for curriculum development to a learner-centred outcomes approach as detailed by Sievert (2002). Course development at the college is a faculty-driven enterprise: the integrity of the curriculum rests with the Curriculum Committee, comprised wholly of faculty members (Portland Community College, 2013c).

In 2007, the college required the Subject Area Committees (equivalent to disciplines) to adopt standard prerequisite courses in recognition of the need to standardise expectations of student preparedness for 200-level courses or courses taught in sequence (Portland Community College, 2013d). The attention to better course sequencing made it easier for librarians to predict the expected critical thinking level for students in each particular course. When Course Content and Outcome Guides (CCOGs) were published online (Portland Community College, 2013a), it became much easier to recognise and target the courses which expressly required IL competencies. In 2011, the author did a keyword search through the schedule of courses using terms like 'research' and 'peer reviewed journals'. There were many courses which matched. Closer review of the CCOGs revealed quite a few variations:

- access research evidence
- bias
- external research
- IL
- information through library and computer resources
- internet research
- journal(s)
- library research
- lifelong learning
- media literacy
- outside research
- research paper
- research query
- research techniques
- scholarly literature
- scholarly reading
- scholarly research
- strategies for researching

Inapplicable terms such as 'field research', 'evidence-based research', 'research method', 'infographics' and 'informatics' were limited out.

Concomitantly, ACRL (Association of College and Research Libraries) collected IL statements developed by discipline groups on their website (2013). To some degree, those statements are too advanced for the community college student, but they did provide our IL programme with targets – goals that the programme should provide preparation for and aspire to.

There has been some articulation of IL outcomes in Oregon. Primarily initiated by Portland State University and Oregon State University's library and writing faculty, they identified and defined IL learning outcomes for 'junior-rising transfer' – that is, associate degree students or those with completion of two years of study, rising to the third year of the baccalaureate degree. Instructional goals for IL embedded in the writing sequence at PCC have been revised to equate to these (Information Literacy Advisory Group of Oregon 2007).

Biology instructors at PCC worked with librarians from the three campuses across the college district to sequence IL skills between selected courses. Their focus was on standardising the approach to teaching students about 'peer reviewed literature' and 'scholarly conversation' within the discipline of biology.

A librarian worked with reading instructors to define appropriate IL course outcomes to be embedded into the course as part of increasing the credits from three up to four. That collaborative work between the librarians and reading instructors was fundamental to evolving a developmental approach to IL at PCC.

The librarians realised that as expectations and requirements were raised across the college district, accountability for student achievement had to be a shared responsibility. We needed a way to illustrate the multiple dimensions of IL that we were beginning to outline and to share that new view with instructors and administrators.

3. Conceptual basis of the framework

3.1 Overview

Currently, the college has no graduation requirement specifically for IL. Three of the six college 'Core Outcomes', however, point to lifelong learning and evaluation – self reflection, critical thinking and cultural awareness (Portland Community College 2013b). Schroeder (2012) did a small survey of college librarians to determine their feelings about the advantages and disadvantages of IL being combined with a critical thinking college core outcome. He points out that 'critical thinking remains ill-defined in these statements, and overall, within the education sphere' (pp. 132-134). Yet, in general, librarians saw advantages in strategically using college critical thinking outcomes to promote IL. 'This renaming helps to move information literacy from mere skills to the more conceptual level of thinking and reasoning … The fact that this outcome to some extent encapsulates information literacy, without using the term information literacy or library jargon, could make it much easier to promote on many campuses' (Schroeder, p. 145). Finding this to be true, we are working at various levels to embed IL throughout the curriculum, with less concern for labeling it IL than for accomplishing a recursive, iterative approach for students' learning and practising the skills and concepts involved.

Some instructors and administrators still subscribe to the notion that any single required assignment for a research paper is sufficient to prepare students for academic writing and research. They assume that citing sources in one or two writing courses will suffice for understanding all applications of proper attribution, avoiding copyright infringement and plagiarism. While librarians certainly do provide library instruction sessions for many of the writing courses, at PCC we also provide instruction and learning objects for a variety of approaches to these concepts.

What could politely be termed the 'immunisation method' of IL is not efficacious. Relying on the belief that introducing important concepts all at once, to be retrieved when later relevant, is counter to learning theory. Miller's (1956) heuristic is that we have a limited capacity to hold any more than about seven items of new information in our short-term memory. As Booth (2011) has observed, when 'it comes to instruction, one size most certainly does not fit all. Scripts seemed to play differently in each class, and exercises and handouts that worked beautifully for others fell flat for me' (xiv). Parsing the curriculum on levels of critical thinking attainment as well as specific content prepares librarians to vary their instruction and make it relevant and engaging for all students.

'Could you just show my students where the databases are on the library website, and how to use them?' an instructor might typically ask. However, the approach to IL as merely tools based offers little conceptual development and only the most rudimentary transferable skills. Fister (1993) suggests instead that librarians teach the 'rhetorical dimensions of research' pointing to how '[t]eaching library research as information retrieval through access tools valorises information retrieval as the purpose of research – a misconception that puzzles students and frustrates teachers.'

She offers several key approaches to ameliorate this misapprehension, beginning with the idea that the search process is for 'tapping into a scholarly communication network'. And more specifically, librarians should teach students to recognise that search terms depend on 'who is speaking', that the value of a source depends on the 'rhetorical dimensions of the text' and that 'searching, reading, and writing are nonconsecutive research activities'.

Instructors frequently give us opportunities to address IL concepts by the writing assignments requiring incorporation of sources that sometimes send students in a panic into the library. Librarians must focus first on what the instructor intended for the student to learn about research, and less on the student's perception of what the essential components are for getting a good grade. The use of tools can be placed into the necessary context when we understand the underlying learning objectives. A compelling strategy is presented by Fox and Doherty's approach of 'backward design' (p. 145) involving setting up a learning experience that will achieve these learning outcomes, hopefully in collaboration with the instructor.

Jamieson and Howard have begun to release compelling research results from their national study, The Citation Project (2013), on how college students use sources in writing research projects. In an interview with researchers from Project Information Literacy, Jamieson and Howard discuss the difficulties students exhibit with understanding the purpose of research and how they are to evaluate sources, make proper use of citations or thoroughly engage with texts. 'Our analysis reveals that 94% of the 1,911 citations [that they evaluated from 174 papers, from 16 colleges] are at the sentence level – quotation, unattributed copying, patchwriting, or paraphrasing … students summarised only 6% of the time, indicating that they either could not or would not engage with extended passages of text. Teaching students to summarise *and how to integrate that summary into researched writing* are compelling pedagogical mandates' (Project Information Literacy 2011).

'Patchwriting' is a phrase the researchers coined to explain students' lack of attention to paraphrasing correctly. They define it as 'restating a phrase, clause, or one or more sentences while staying close to the language or syntax of the sentence' (Project Information Literacy 2011). It is not the responsibility of librarians to teach composition. It is useful however to anticipate the possible thickets students may enter as they attempt to incorporate sources into their writing, as well as to point out the type of critical thinking work required to fully appreciate what the sources represent.

3.2 Theoretical frame

Imagine that you have just opened an email from a friend, who assures you that it contains a really hilarious joke. You start to read:

> OK … This lawn supervisor was out on a sprinkler maintenance job, and he started working on a Findlay sprinkler head with a Langstrom seven-inch gangly wrench. Just then this little apprentice leaned over and said, 'You can't work on a Findlay sprinkler head with a Langstrom seven-inch wrench.' Well, this infuriated the supervisor, so he went and got Volume 14 of the Kinsley manual, and he reads to him and says, 'The Langstrom seven-inch wrench can be used with the Findlay sprocket.' Just then the little apprentice leaned over and says, 'It says sprocket, not socket!' (Martin 2008).

Without the gestures and comedic timing of the joke teller, much of the humor is lost. But even if you were able to see and hear him, it still would be difficult to comprehend the story unless you understood the jargon. Many of the words seem familiar, and the rest sound plausible. But how are you to decipher the complete meaning, much less interpret the joke – if you are not a plumber? Students new to college find themselves in a similar position, beginning the process of code switching, discourse analysis and making the shifts in perception required for academic success.

Presenting IL in some generic form, in a prerequisite course, will not address students' need for time to practice. With better appreciation for fully integrating IL into course outcomes in a developmental way, Bean and Iyer (2009) have observed that 'a significant benefit of our partnership with reference librarians is our fruitful discussion of the epistemological differences between an information retrieval view of research, with its emphasis on topics and information, and a constructivist, inquiry model with its emphasis on questions and meanings' (p. 34).

Consider the parallels between Kuhlthau's (2004) 'uncertainty principle' in her analysis of the information search process, and Kinchin's view of 'conceptual stasis' related to threshold concepts. Kinchin (2010) says that the 'thresholds create moments of transformative change whilst the periods of conceptual stasis, rather than being 'nothing,' are required to assemble the raw materials that will facilitate that change … Stasis is required as part of the learning process: 'lining up' the segmental and cumulative knowledge structures for subsequent integration' (pp. 56-57). Would not this stage of processing and assembling come with some anxiety about completion and achievement? We have used these concepts about the recursive nature of learning new ideas and exploring information with pre-college-ready students, and in courses where use of library sources is introductory.

The shift that librarians at PCC needed to emphasise was from focusing on tools and structured search patterns towards a more conceptual basis. Discussions were had, for example, about why the reading instructors insisted that librarians use examples of peer reviewed sources in pre-college-level courses. That seemed ridiculous initially. But then the librarians realised that by introducing the concept as part of placing information sources into the publication cycle, students could begin to outline aspects of authority; the librarians could ask students then to reflect more deeply on their reasons for selecting a source.

In a developmental view, teaching how to determine the quality of a search strategy, and how to be self-reflective about the effectiveness of it, first requires beginning with a scaffolding process. As the study by Wood et al. (1976) summarises, scaffolding is a process whereby a novice is enabled to solve a problem or carry out a task which would be beyond her/his capacity without assistance (p. 90). Their 'reduction in degrees of freedom' strategy is used in the sense of giving students a simple task at first, to gauge their level of familiarity and to ensure their success. 'Demonstration' as identified by Wood et al. is then used in leaving the completion of the modelled task to be discovered by the student (p.98).

Caution is to be observed, however, when planning to use discovery, or problem-based learning, as Clark et al. (2012) point out, quoting from Richard Mayer's work:

> Many educators confuse 'constructivism,' which is a theory of how one learns and sees the world, with a prescription for how to teach. In the field of cognitive science, constructivism is a widely accepted theory of learning; it claims that learners must construct mental representations of the world by engaging in active cognitive processing. Many educators … have latched on to this notion of students having to 'construct' their own knowledge, and have *assumed* that the best way to promote such construction is to have students try to discover new knowledge or solve new problems without explicit guidance from the teacher. Unfortunately, this assumption is both widespread and incorrect … Withholding information from students does not facilitate the construction of knowledge (p. 8).

The key here is to understand that 'two facts – that working memory is very limited when dealing with novel information, but that it is not limited when dealing with organised information stored in

long-term memory – explain why partially or minimally guided instruction typically is ineffective for novices, but can be effective for experts' (p. 9). Students working independently or in small groups can be effective, they acknowledge, but purely 'as a means of *practicing* recently learned content and skills' (p. 6).

The progression of learning is not entirely predictable, and the teaching of it should vary as infinitely as individual students but also be bounded by a framework of learning outcomes and progression through cognitive domains. Community college librarians can ask guiding questions to help the student determine for themselves what they are to learn and how; they can situate the encounter within the paradigm of an IL developmental level and assignment objective; they can make informed decisions (in a split second!) of what to offer in terms of support or challenge. Thus, in a more general sense, useful scaffolding is a 'careful gauging of 'enough' support, but not too much, at the 'right' time, but for not too long' (Schoenbach et al. 2012, p. 21).

Adult returning students often lack the background knowledge needed for success in an academic setting, but they *do have* background knowledge, and schema, for what interests them, and for what their life experience has been. As they learn to access the schema they possess, they gain the confidence to build new schema. In his introduction to Bruner's collection of papers, *Beyond the information given*, Jeremy Anglin (1973) refers back to Frederick Bartlett's 1932 *Remembering* and his view of schema as 'that integrated, organised representation of past behavior and experience which guides an individual in reconstructing previously encountered material' (p. xviii). Anderson (1984) provides this classic example of schema: 'The big number 37 smashed the ball over the fence' (p. 595). As with an inside joke, a person without any knowledge of what is being referred to would have extreme difficulty in correctly interpreting that sentence. They might easily read each word, but not be able to understand the import.

Encouraged to be self-aware and self-reflective, students can also realise the extent of problem-solving strategies that they do actually possess. In a community college, librarians should assist students bridging these two worlds, of not knowing that they do not know (or what they must first learn) and apprehending the amount of knowledge they do not possess – a possibly discouraging recognition. For, as Dunning (2005) has discovered, 'The reason … individuals cannot be expected to recognise their deficits is that they are doubly cursed: in many areas of life, the skills necessary to *produce* competent responses to the outside world are also the exact same skills needed to *recognise* whether one acted competently' (pp. 15-16).

As Bruner (1964) concludes,

> … there is an appropriate version of any skill or knowledge that may be imparted at whatever age one wishes to begin teaching – however preparatory the version may be. The choice of an earlier version is based upon what it is one is hoping to cumulate. The deepening and enrichment of this earlier understanding is again a source of reward for intellectual labors (p. 477).

In a similarly hopeful vein, Head and Eisenberg have noted that students' engagement in using library resources or deciding on a topic to research is not inhibited by a lack of motivation or due to a lack of places to begin. They have found that 'the beginning of research was not difficult because students were short on ideas; quite the contrary. Second, starting on research was not difficult because they were disinterested or unmotivated – a large majority of them were conscientious and in courses to succeed and to learn' (2010, p. 32).

Students can find 'course-related research … difficult because it was more akin to gambling than completing college-level work,' Head and Eisenberg say.

> The beginning of research is when the first bets were placed. Choosing a topic is fraught with risk for many students … Add in the constraints of timing, grades, and too much available information to scour – and the difficulties with beginning research are put into high relief. The odds of 'winning' this bet are significantly compromised when these factors come into play (2010, pp. 32-33).

4. Course Specific Research Support Forms

A Course Specific Research Support Form (Appendix 1) is set up for each course that has IL-related outcomes. The PCC Library has over 80 forms completed (Portland Community College 2013). There are three parts to the form:
- Placement of the course within the Research Support Framework
- Indicators from the Course Content Outcomes Guide for IL
- Course integrated research support

This last part of the form includes IL outcomes mapped to the course outcomes; instructional objectives for instruction sessions; bridging competencies and threshold concepts; and finally, recommended library tools and guides. A major purpose of the forms is to encourage instructors to consider how best to situate the IL learning experiences and concepts within their own instructional design. The decision about how much a librarian participates in presenting to their class or designing activities or assessments is ideally a collaborative one. The forms also allow instructors to design IL activities independently. They provide a way to flowchart the decision process about the balance between preparatory skills, practice and critical thinking achievement.

Careful attention is given to vocabulary on the forms to replicate the focus and terminology particular to each discipline. PCC Librarians adopt the terms that the instructors in those disciplines typically use, not the other way around. They use the Course Specific Research Support Forms to think both broadly about what students need to do to achieve the college's core outcomes, and more specifically, to identify the typical interstices in students' understandings or experiences for IL. Admittedly, the Research Support Framework and accompanying forms are a snapshot, with some structural integrity, as course outcomes are under constant revision.

5. Structure of the Research Support Framework

The six steps of the traditional 'Bloom's taxonomy of educational objectives' (Armstrong 2013) are listed across the top of the Framework (Appendix 2). An example is stated for each step from the taxonomy such as 'Identify what is being communicated' for the foundational step of 'knowledge.'

The six steps from the Taxonomy correlate roughly to the progression through three instructional categories: perceptual shifts and basic skills; information mediation; higher-level critical thinking. Each instructional category has two stages, aligned with the cognitive domains at the bottom of the framework. The resulting six instructional stages have examples from the students' point of view.

Next, sample courses are placed on a linear scale to illustrate their approximate alignment with the developmental level of IL attainment. These levels do not necessarily correspond to how the courses are sequenced in the curriculum. The decision as to where to place a course depends on the specific IL-related course outcomes; which prerequisites the course may have; if there are any courses lower or prior in the sequence which have IL outcomes and the experience of the librarians teaching IL sessions to students in the courses.

The six cognitive domains are, from left to right:
1. Connecting to college
2. Information seeking
3. Skills
4. Academic inquiry
5. Exploration
6. Scholarship

Since courses in different disciplines can have similar IL outcomes, the model presented here is iterative, allowing students to practice through various learning experiences in different contexts. However, students may not differentiate between library instruction sessions and may initially be resistant to yet another one, as Bell (2007) observes: 'From the students' perspective all instruction may appear to be the same. Exposure to a variety of information literacy sessions … can lead students to assume that any librarian providing instruction … is simply there to rehash an earlier presentation' (p. 99). To counter what he calls the 'I Already Know This' syndrome, he places the responsibility on the librarian to 'employ pedagogical methods that will enable students to distinguish between multiple sessions to recognise their distinctive and differentiated features' (p. 99). His solution? Put the students in charge for the moment, demonstrating to the class their search strategies in the databases they (or their small group) have selected. Turn the room into a lab, in other words, with the students making their thinking visible and sharing what they have discovered or know (p. 101).

5.1 IL instruction dimension one: perceptual shifts and skills instruction

In this first instruction dimension, the factors for student success resemble 'first-year experience' needs, as defined by Upcraft et al. (2005, pp. 8-9), but can often include addressing other factors which can inhibit learning. These can include previous negative learning experiences, undiagnosed (or hidden) learning disabilities and aspects of post-traumatic stress disorder, economic hardship and employment displacement.

At the other end of the spectrum, for the dual-enrolled high school/college student, one instructor has noted that a 'friendly smile and open-ended support in helping students find what they are looking for [is key]. What is significant is the library is often one of the first places students head after the classroom. I think that the smile and support is more powerful and important than most staff know for students' (Lekas, 2013).

5.1.1 Cognitive domain: connecting to college

The library instruction activities for this beginning level cognitive domain will include learning objectives similar to the course outcomes, which at first glance may seem unrelated to library research. But skills like note taking are foundational to academic success. Acknowledging students' accomplishments of sequenced tasks helps them build incremental success. At this level, the affective is emphasised. Students are able to have a positive relationship with a college staff member beyond their course instructors, and they have a place to belong.

'Measureable' verbs (for example, as indicated in Hinton 2013) from Bloom's taxonomy for the 'Knowledge' stage include:
- define
- label
- listen
- locate
- name
- recall
- select

5.1.1.1 Student view of IL outcomes for connecting to college

- I know what the library is, and where the library is
- I feel like the library is a welcoming place
- I know who the librarians are

When students physically experience the library as place and they orient to the services, they accomplish a necessary step for developing understanding and decoding skills, especially for those who have never experienced a library before. When librarians direct students to robust collections on topics like managing test anxiety or career assessment, with the challenge to use at least one item, they accomplish two goals. They initiate students into the frame of using sources beyond what they are familiar with, or can easily access within their personal 'filter bubble' (Pariser, 2011, p. 9). They also extend and solidify the idea of librarians as contacts for referral and support.

At this first stage of the Research Support Framework, we keep the objectives of the learning experiences simple and accomplishable in a short timeframe in order for the library visit to be a predictably positive experience. We also incorporate the social aspect of learning, using group work and discussion, for active learning and frankly, fun.

5.1.2 Cognitive domain: information seeking

The principles introduced in the next level up of critical thinking, the cognitive domain of information seeking, are applied again later for discerning the many types of sources which can be framed by a computer screen. We start with the obvious indicators, like author and title, and introduce the types of information 'channels' (Bystrőm, 2005, pp.175-176).

Verbs for the 'Comprehension' stage include:
- describe
- explain
- identify
- match
- summarise

5.1.2.1 Student view of IL outcomes for information seeking

- I can identify a topic
- I can identify library services and know which ones can help me

Rudimentary understanding of the typical publication cycle is introduced here. Students learn how to fill in their background knowledge with sources offering some indicators of reliability, and to stretch beyond sources which only amplify their initial opinions.

Students at this level often prefer task-oriented assignments as opposed to extending their critical thinking skills. Until they gain confidence, they can over-focus on the requirements of an assignment and deliberately avoid imagination or creativity. Cox (2009) found that community college students assumed that knowledge was only what was graded in a course – their immature and 'underlying assumptions about knowledge and learning not only structured [their] expectations for the appropriate instructional method (lecture and recitation) and course content (facts to be tested), but also shaped their perspective on what kinds of activities were relevant to *learning* the course material' (p. 98). Some resistance to exercises in self-reflection or extending thought, then, is to be somewhat expected.

Creativity and learning – that branching out from what one is sure of – requires gaining a level of acceptance with ambiguity and spending time working even when not assured of a conclusive answer. Taking the time to access the creative part of thinking is difficult, if not painful, requiring a special kind of effort. To show students that this is true for all of us is encouraging to them. Instructors can alleviate some of this trepidation by demonstrating, in an authentic way, what they do when they encounter something that is unfamiliar to them, or hard for them to understand. Schoenbach et al. (2012) make a persuasive case for training students to identify – to be metacognitive about – their schema. It is a 'concept that students should understand and own. They can think of schema as a personal library of knowledge – based on a lifetime of reading and experience – that they already have and can draw on, add to daily, and revise if they need to as they learn more. This information is organised, filed for future retrieval' (p. 234).

PCC librarians acknowledge that they need to be careful not to go to the sources with students too soon. The librarians realise that when a student repeatedly asks different librarians for confirmation about whether they have a 'good topic', they may be exhibiting the desire to shorten the enquiry process. Students can end up with a wonderfully constructed research question with no idea of how to research it, and little interest in doing so. Difficult search strategy problems arise at this stage. If a student takes a position not based in fact, they will expend a great deal of time searching for sources to verify their claims, ending up with webpages of dubious authority. If they assume that the purpose of a research paper is to present a series of 'uncontroversially true statements' (Graff, 2003, p.53), then they are not encouraged to explore information any deeper than simply matching on key words. And if they assume, as Lee (2013) suggests they might, that 'these projects are a scavenger hunt to retrieve information the instructor is already familiar with' (p. 51), they may write the paper first, and simply search for corroborating sources afterwards.

An introduction to the 'intellectual standards' of critical thinking as outlined by Paul and Elder (2011) is useful to emphasise the work involved in topic development, albeit as novices. Published online as the 'Universal Intellectual Standards' (National Council for Excellence in Critical Thinking, 2011) they include these qualities:
- clarity
- accuracy
- precision
- relevance
- depth
- breadth
- logic

Librarians could use prompting questions such as, 'I'm not clear about your position. Could you state it in other words?' or 'Can you articulate other reasonable ways of looking at the issue?' (Paul and Elder, 2011, p. 42) to assist students in measuring their attention to thinking their argument through.

Topic development at the level of 'information seeking' begins with students identifying their schema and background knowledge and activating their problem solving strategies in order to make a commitment to a single topic area. Teston and McNely (2013) discuss the difficulty students have with research question development, and maintaining deep focus on one question, preferring instead to use 'some kind of topic, technology, idea, or interest' (p. 220). Students tended to add in 'peripheral questions' as 'a result of not feeling comfortable with the narrowing of their investigative gaze to specific practices' (p. 219). Students typically start with a personal interest but struggle to identify what is researchable when they assume that texts are written only to present facts and are without conflict or contradiction. To structure a search students not only need the topic area but also a conflict or issue within it: what would make their interest area reportable, worthy of news, or worthy of study?

5.2 IL instruction dimension two: information mediation

The second instructional dimension, information mediation, is for courses which have prerequisites. The PCC librarians have placed courses upon the Framework based not just on the course numbers, but by what is actually in the course outcomes. This placement is also informed by the librarians' experiences with teaching students in library instruction sessions and in assisting students through reference services.

5.2.1 Cognitive domain: information skills

Clearly differentiating fact from opinion is the emphasis for the cognitive domain of information skills. Composition at this level is typically in the pattern of a form of extended definition (narration, description, examples, compare/contrast, classification, cause/effect, process analysis), and may lead to a short (five page) research paper. Students are expected to recognise the elements for citations and to incorporate sources properly.

Verbs for the 'Application' stage include:
- apply
- construct
- demonstrate
- differentiate
- interpret

5.2.1.1 Student view of IL outcomes for information skills
- I can develop a topic
- I can search a database and get related results

Community college librarians should address the gaps in students' experience and use examples of bridging concepts for scaffolding as necessary. Students at this level may depend on simple matching of search terms to words in the title or abstract. They need to be guided to go beyond the decoding mode of reading to the deciphering and to thinking of related concepts, especially for source selection.

Students are expected to give closer scrutiny to types of sources, and to the difference between popular and scholarly sources. The concept of peer review is introduced in a basic way. Identifiers such as affiliation, or if the source is cited by others, are concepts introduced here.

Identifying perspective and point of view should be clarified. The first can encompass the second; that is, architects would research a topic like skateboarding in terms of building design and aesthetics, from the perspective of their discipline. But within that camp, individual architects will have different points of view about the importance or approaches to be considered in particular design projects. On controversial social issues it is far easier for students to find sources with which they agree because they tend to use the diction with which they are familiar for their keyword search terms. Instruction then is necessary in what Kovach and Rosenstiel (2010) identify as 'marketing and code words' (p. 90), for students to recognise the appeal to emotion or attempt to persuade, such as 'death tax' v. 'inheritance tax' (p. 91). Topic development for the instructional domain of 'skills' takes into account that students will now have some beginning discipline specific knowledge, so they can identify particular controversies and points of view. They are to use secondary sources and incorporate them into their projects to support their arguments. For initially simple *topics* to move to a *question* for research, students will need to follow models for argumentation. The deceptively simple pro/con mode is popular, but they need to rise above the simple 'he said/she said' reduction.

Students struggle to locate sources to incorporate into their writing to support their thesis because they lack the academic literacy for viewing themselves as 'constructors of questions that do not have immediate answers', as well as being unable to acknowledge that they are 'empowered to contribute to broader previously published conversations surrounding their research questions' (Teston and McNely 2013, p. 223). They 'perceive the act of consulting outside sources as having the fundamental aim of verification' rather than conversation, Teston and McNely show (p .222), which short-circuits the research process.

Graff illustrates how students' misunderstanding of persuasion as aggression (p. 56) coupled with their inexperience in summarising others' points of views before contesting them (p. 59) inhibits their perceiving the writing process as conversation. Cox adds the related dimension of students assuming that argumentation can be reduced to 'having opinions' (p. 142).

Toulmin's model (2003) is a useful one for students to structure their argument more thoughtfully. He calls for identifying the 'claims' of the argument, the reasons and data for evidence for the 'support', and finally, the 'warrants', or the underlying implied assumptions (pp. 90-91). To develop a researchable question, a 'question that will work' – that is, one which is simple, requires some analysis and leads to evidence (Badke, 2011 p.36) – clearly requires some background reading first. Ideally, the thesis statement would arise *after* reading and critically analysing sources and the arguments and evidence they contain.

5.2.2 Cognitive domain: academic inquiry

A more complex view of information generation is introduced at the academic inquiry cognitive domain, tying more into discipline specific modes of writing and the differences in the information cycle, depending on the discipline. Instructors focus on discipline specific contexts, but are often directive about topic selection and search terms.

As Gibson (1995) summarises Richard Paul's assumptions about critical thinking, students at this level are in the 'weak sense' of critical thinking, with it 'comprised of the sophisticated, but often sophistic, use of critical thinking microskills such as argument analysis, synthesis, and

evaluation' (p. 28). Students' research assignments are structured, somewhat reductively, in order to ensure that they gain 'core concepts' for disciplinary reading and writing.

Verbs for the 'Analysis' stage include:
- analyse
- compare
- contrast
- critique
- dissect
- propose

5.2.2.1 Student view of IL outcomes for academic inquiry
- Are the qualities of the results what I need?
- Can these information sources help support my thesis?

Delving into why an information source was created and the possibility of misconstrued or deliberately misleading content is now emphasised. The consequences of the 24-hour news cycle, crowd-sourced content and newer forms of authority are key concepts to present.

Despite their focus on news journalism, Kovach and Rosenstiel (2010) offer insights into how students can avoid being misled by biased or poorly supported sources. They point to three levels of meaning, including 'denotative, connotative, and annotative … [asking] what does the information signify? What does it imply?' And lastly, 'how does the information make us feel, what is the tone of it?' (pp. 114-115) Students need to identify the import of the text and critically examine their response to it, using what Kovach and Rosenstiel term the 'skeptical way of knowing' (pp. 31-32):
1. What kind of content am I encountering?
2. Is the information complete, and if not, what is missing?
3. Who or what are the sources, and why should I believe them?
4. What evidence is presented, and how was it tested or vetted?
5. What might be an alternative explanation or understanding?
6. Am I learning what I need to?

When students are prompted to recognise the schema they bring to solving problems, they begin to connect new knowledge to what they already possess. Still, thinking is strenuous, as Willingham (2009) observes, to the point that 'humans don't think very often because our brains are not designed for thought but for the avoidance of thought' (p. 4). Further, 'compared to your ability to see and move, thinking is slow, effortful, and uncertain' (p. 5).

He elaborates: 'Fortunately, the story doesn't end with people stubbornly refusing to think. Despite the fact that we're not that good at it, we actually *like* to think. We are naturally curious, and we look for opportunities to engage in certain types of thought. But because thinking is so hard, the conditions have to be right for this curiosity to thrive' (p. 9). Providing a standardised lecture about accessing and searching the online catalogue or the intricacies of database interfaces is ineffective at best and disheartening at worst, even when librarians might correctly assume students are somewhat familiar with their discipline and motivated for self-directed searching. As Willingham observes, it is the 'pleasurable rush of solving a problem' that highly motivates students (p. 19). He supports the idea that new knowledge is gained more easily by connecting to what is already known, suggesting that using analogies is a useful idea because of this (p.89).

'Novice assumptions' which need to be undone at this point – as Bean and Iyer (2009) outline – include 'privileging the 'thesis statement' rather than the 'thesis question'' and 'imagining that the purpose of research is to 'find' an answer to their research question rather than to 'make' an answer.' They note the tendency of students to desire 'early closure – settling quickly on a thesis statement rather than dwelling with a problematic and significant thesis question.' And worse, 'novice researchers think that the purpose of library research is to find answers to their research questions – as if research results in right answers rather than in claims supported by arguments' (p. 29).

A librarian's teaching role could indeed incorporate demonstrating database searching. Yet, in this context, the emphasis is not on differences in interfaces or presenting a flawless search, but on 'modeling a trial and error research process, trying different combinations of keyword or subject searches' (Bean and Iyer 2009, p. 33).

5.3 IL instruction dimension three: critical thinking support

Community college courses do not require the level of scholarly research that is expected in upper division university work. And by this point many 200 level courses are so heavy with lab work or practicums that library assignments are infrequently included. There are courses with outcomes which require 'primary documents' or 'peer reviewed sources,' so students might be required to pursue some actual primary research, albeit in a limited way.

5.3.1 Cognitive domain: exploration

Students at the level of the exploration cognitive domain use the traditional indicators of reliability, such as author affiliation and discipline specific terminology. They also must begin to determine boundaries of 'trust and credibility … through a track record of positive contribution' in sources such as blogs and wikis (Farkas 2012, pp. 83-84). Students are beginning to approach, as Gilbert (1995) summarises Richard Paul, the 'strong sense critical thinking' whereby a student 'possesses a disciplined, fair minded, multilogical perspective on an issue or problem so that the reasoner is not trapped by egocentricity or self-deception' (p. 32). Fully entering into using 'participatory technologies' (Farkas) like blogs or wikis for collaborative content building or public reflection and defence of their views (p. 87) requires students to have the skills necessary for establishing a social presence. They also will need practice in editing each other's work (p. 88). Despite personal familiarity with various social networking technologies, students will need guidance in the etiquette of group editing shared documents. They will also need to see examples of how professionals vet or constructively criticise each other's views through these technologies.

For students who are unfamiliar with the traditional methods of determining authority of print sources, authority for web-based sources is even more perplexing. Fritch and Cromwell (2001) suggest that the way to determine the 'validity' and 'affiliation' of what they term the 'cognitive authority' of sources is by considering these questions:
- Document Validity:
  - Factual accuracy of information
    - Does the information fail a personal, basic credibility test?
    - Are sources cited?
    - Can the information be corroborated?
    - Is the information out of date?
  - Information presentation and format

- - Updated recently?
  - Statement of responsibility/attribution?
  - Bibliography/references?
  - Well organised?
  - Indication of edition or version?
  - Site map or index present?
  - Grammatically accurate?
  - o Organisational or institutional identity and authority (in this context, determined through analysis of the URL or email address)
- Overt affiliation with an organisation, institution, or individual:
  - o Advertisements
  - o Links to organisational home page(s)
  - o Links to other listings of resources
- Covert affiliation with an organisation, institution, or individual:
  - o Are there hidden affiliations that are neither obvious nor immediately detectable?

Verbs for the 'Synthesis' stage include:
- compose
- create
- develop
- estimate
- formulate
- integrate
- solve
- synthesise

5.3.1.1 Student view of IL outcomes for exploration

- I can use these resources to identify pro and con positions
- I understand the scholarly conversation in this discipline and can recognise experts

A full understanding of the peer review process is expected here, not only as a qualifier for reliability, but also relevance. Students will use the 'cited by' in Google Scholar and databases to measure the influence of articles, and to locate more current sources. Citation tracking is introduced as a concept at this point. To get students to the point of readiness for this understanding, PCC instructors have collaborated with librarians to identify discipline specific approaches to information, or what they loosely term 'threshold concepts'. For Biology 212 for example, the IMRAD (Introduction, Methods, Results and Discussion) structure of scientific journal articles must be understood before students can grasp that in reporting research projects results, scholars are 'conversing' with previous researchers.

More than a stepping stone or core concept, a true threshold concept as Meyer and Land define it (2006) is one that is 'akin to a portal, opening up a new and previously inaccessible way of thinking about something. It represents a transformed way of understanding, or interpreting, or viewing something without which the learner cannot progress' (p. 3). In the context of biology, Kinchin (2010) identifies 'evolution' and 'dynamic transformation' as fitting this frame (p. 55).

The four likely attributes of threshold concepts – that they are transformative, irreversible, integrative and bounded – which Meyer and Land have described (2006, pp. 7-8) are applied to IL by Townsend et al. (2011). Relevant here is the concept of 'format as process' where 'the discourse moves from 'what' (characteristics, features) to 'why' (disciplinary communication,

channels of production)' (p. 861). Therefore, students should consider critical questions. What is the purpose of following the IMRAD structure for a scientific journal article? What are the implications of the chosen research methods? How long did it take from initial submission to the date of publication? Then they would be ready for the discipline specific research approached in the next cognitive domain.

5.3.2 Cognitive domain: scholarship

Courses with IL outcomes at the level of 'scholarship' (within the context of the second year community college) are typically for transfer students seeking particular majors, or, for one-year certificate or two-year associate degrees in career/technical programmes. Complexity in both research and in analysis of sources is contextual, tied to their chosen major or career path. As community college graduates, students should be able to demonstrate 'the ability to adapt to new learning contexts by switching between identities and practices appropriate to them' (Webster, 2013, p. 123). The lifelong application of this is to capitalise on the 'diverse knowledge contained within the individuals in their network and also contribute their own knowledge to a collective understanding' (Farkas 2012, p.86). The common denominator for both academic and career track students here is the requirement to select timely sources, to identify specific reasons for their reliability and usefulness and to use them in an ethical manner to build new knowledge.

Professional competence for students in programmes as varied as Management and Supervisory Development, Veterinary Technology or Microelectronics requires the ability to assess the validity as well as the usefulness of information. Graduates in these programmes are expected to continuously update their knowledge stores with the technical information required for their job duties, but also to be aware of new trends to embrace or avoid. They will be expected to use information in an ethical manner, but also in an expeditious way. Traditional privacy concerns will be of less importance in the workplace than leveraging one's digital footprint into the ever-evolving, socially networked environment of information sharing.

Verbs for the 'Evaluation' stage include:
- appraise
- assess
- choose why
- dispute
- judge
- measure
- qualify
- value
- verify

5.3.2.1 Student view of IL outcomes for scholarship

- I can explain and describe my position on an issue, and support it with primary sources
- I can accurately summarise the scholarly conversation on an issue

Topic development for this final instructional dimension requires using discipline specific modes of argument. Students will need to recognise the publication cycle for their field, and apply that to source selection. They will need to know what the various information outlets are and their relative value in terms of usefulness as compared to authority or reliability. They will be

prepared for either transfer to the third year of a baccalaureate or qualified for entry level into a career field.

6. Future Plans

Librarians at PCC will review the course inventory developed from the Course Specific Research Support Forms to ensure the IL instruction is sequenced properly through each discipline area. Attendant upon this is to continue their involvement with college-wide assessment of the college core outcomes. They will continue to collaborate with librarians across Oregon to respond to statewide articulation efforts for K-16 (kindergarten through baccalaureate) IL outcomes as they are established. Identifying courses with IL outcomes is currently a hands-on individual effort. They would eventually like to involve college services to automate the search for IL-related course outcomes.

7. Conclusion

The Research Support Framework is not only about an upward progression for academic performance. It is also a multi-dimensional view of IL outcomes across the community college curriculum and for each possible stopping point of a student's interaction with the college. It assumes progression through the curriculum, yet accounts for scaffolding needed to solve gaps. It is as much about nurturing curiosity and imagination as learning to participate in civil discourse and scholarly argumentation. The Framework is grounded in the efficacy of nurturing creativity and building self-confidence.

This holistic approach encourages librarian collaboration and sharing. While based on learning theory, the emphasis is on practical application and pedagogy, and is used to build the PCC librarians' repertoires in instructional design and lesson planning. Their focus is on increasing faculty awareness of IL, rather than moving the college to a stand-alone college core outcome. They customise their library instruction learning outcomes and invite the instructors to participate with them. Just as academic reading is in actuality problem solving – not just a single skill learned once and forever – IL skills and concepts must evolve through the curriculum and over time.

The PCC librarians see their teaching and outreach as providing students with the parts of an achievable whole. They view the library instruction sessions as cumulatively productive, adding up to a programmatic fulfillment of the college core outcomes.

Their interest has been to take hold of existing ideas and tools and to combine them into a useable and revelatory framework. The effort is scalable up to the point of including all graduates, with training and teaching collaboration of instructors. IL can then be approached on many fronts at once, primarily relevant to the curriculum, not seen as an add-on or supplement to coursework. This framework is set up as a guide to instructors seeking not only to identify useful assignments and sources, but also to raise awareness of the iterative nature of IL outcomes.

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Appendix 1: Course Specific Research Support Form

Microbiology

Use this tool to see how librarians can help support information and research integration in your class. This guide was prepared by the librarians for Microbiology (BI 234).

Research support framework

The following shows where Microbiology fits into the Research Support Framework [pdf] developed by the librarians.

Information literacy developmental stage:

Critical Thinking Support
7. I can explain and describe my position on this issue, and support it with primary sources
8. I can accurately summarise the scholarly conversation

Cognitive domains and information literacy outcomes:

Scholarship
*   Complexity in research and analysis
*   Participant in scholarly conversation

Library support of CCOGs

These are the course outcomes and other indicators which require library support.

CCOG for BI 234
Intended course outcomes related to information literacy:
*   B. Use an understanding of the impact of microbes on human cultures around the world both historically and in the present day to evaluate current social health issues.
*   D. Use an understanding of research and laboratory experiences to organise, evaluate, and present data and information to illustrate and articulate basic microbiology concepts.

Outcome assessment strategies relating to information literacy:
*   Research paper(s) on microbial topics, library skills and presentations

Course content relating to information literacy:
*   Library research skills
    Writing scientific research paper

Course integrated research support

These are the ways that the librarians can support information literacy achievement for the students in this course.

Corresponding information literacy outcomes:
1. Identify and select a research question related to microbiology and human culture
2. Locate and use sources from primary scientific literature to support thesis
3. Identify reliable quantitative data sources for current social health issues

Information literacy instructional objectives:
1. Identify and select a research question related to microbiology and human culture
2. Locate and use sources from primary scientific literature to support thesis
3. Identify reliable quantitative data sources for current social health issues

Bridging competencies:
- Understand utility of books for historical topics, using their indexes and table of contents to read selectively
- Navigate to library databases, to select those that are appropriate for selected topic(s)
- Identify 'authority' of authors, recognizing significance of author affiliation statements or organisations
- Differentiate between magazine and journal articles

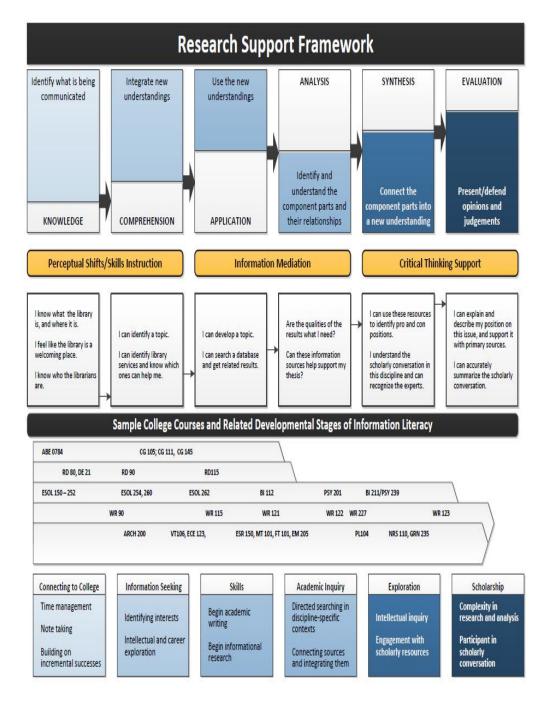**Recommended tools and guides:**
- Tutorials and Handouts for Research Tools
- Biology Research Guide

Library Assignment Ideas:
- Using Google Scholar, search for a journal article about a Microbiology topic, then link out to the 'Cited By' authors

Appendix 2: Research support framework

Research Support Framework

Identify what is being communicated	Integrate new understandings	Use the new understandings	ANALYSIS	SYNTHESIS	EVALUATION
KNOWLEDGE	COMPREHENSION	APPLICATION	Identify and understand the component parts and their relationships	Connect the component parts into a new understanding	Present/defend opinions and judgements

Perceptual Shifts/Skills Instruction — **Information Mediation** — **Critical Thinking Support**

I know what the library is, and where it is. I feel like the library is a welcoming place. I know who the librarians are.	I can identify a topic. I can identify library services and know which ones can help me.	I can develop a topic. I can search a database and get related results.	Are the qualities of the results what I need? Can these information sources help support my thesis?	I can use these resources to identify pro and con positions. I understand the scholarly conversation in this discipline and can recognize the experts.	I can explain and describe my position on this issue, and support it with primary sources. I can accurately summarize the scholarly conversation.

Sample College Courses and Related Developmental Stages of Information Literacy

ABE 0784	CG 105; CG 111, CG 145					
RD 80, DE 21	RD 90	RD115				
ESOL 150 – 252	ESOL 254, 260	ESOL 262	BI 112	PSY 201	BI 211/PSY 239	
	WR 90	WR 115	WR 121	WR 122 WR 227	WR 123	
	ARCH 200	VT106, ECE 123,	ESR 150, MT 101, FT 101, EM 205	PL104	NRS 110, GRN 235	

Connecting to College	Information Seeking	Skills	Academic Inquiry	Exploration	Scholarship
Time management Note taking Building on incremental successes	Identifying interests Intellectual and career exploration	Begin academic writing Begin informational research	Directed searching in discipline-specific contexts Connecting sources and integrating them	Intellectual inquiry Engagement with scholarly resources	Complexity in research and analysis Participant in scholarly conversation

Glossary of American community college terms

Associate
A two year, post-high-school college degree, with courses equivalent and transferrable to a four-year university.

Closed programme
Students begin coursework with a cohort group. Entrance into closed programmes like aviation technology or nursing is competitive, with required prerequisite courses and interviews.

Co-enrolled
Community college students who are enrolled in two community colleges at once, or enrolled at a university as well as the community college.

Cohort groups
Students who are scheduled together in courses for a quarter term, or through a sequence of courses form cohort groups.

College district
The geographic (and tax-base) area which encompasses the various campuses and centres of a multicampus community college can cross several city and county boundaries. The 'district' also refers to the college as a single entity, in terms of mission and policies.

Community colleges
Non-profit, state and federally funded institutions established for the dual roles of career training and preparation of students intending to transfer into four-year universities to later complete bachelor's degrees. Portland Community College is guided by publically elected members of the Board of Directors. All students are required to take placement tests prior to matriculation. Average age of students is in the mid-thirties, due to adults opting in for preparation for academic degrees or retraining to seek better career options. Graduates can be at three levels:
- One-year career/technical certificate for employment
- Two-year career/technical certificate for employment
- Two-year degrees:
    - Associate in Arts
    - Associate in Arts and Sciences
    - Associate in Applied Science
    - Associate in General Studies

In addition, students can gain licensure, certification and entry-level occupational training in less than a year.

Dual-enrolled
High school students may also register for courses at the community college, with certain restrictions, gaining college credit along with high school graduation.

First-year experience
Generally not available to community college students, this standardised instruction for undergraduates assists their adjustment to the academic rigors of college.

Freshman seminar
Introductory learning experiences for first-year college students: generally not available in community colleges, due to the rotating nature of open enrollment.

High school
Academic grades 9 through 12. Students in high school have an average age of 14 through 19 years. A 'general equivalency degree' (GED) may be achieved through a community college if a student drops out of high school.

Junior-rising
A community college student who has completed coursework equivalent to the first two years of a four year university, whether they have taken a degree or not, may rise to 'junior' level. College levels start with 'freshmen' (used for both men and women) at the first year; 'sophomores' at the second year; 'juniors' at the third year and 'seniors' at the fourth year. These terms are also applied to high school students.

Open enrollment
The community college offers admission to anyone over the age of 18 who can fund the tuition and fees. Students are required to take placement exams prior to matriculation unless they have a previous college degree. There are no other *academic* requirements prior to admission or enrollment in courses. With the exception of closed programmes, which require strict sequencing of coursework, students may enroll at any quarter of the year.

Pre-college
Community college students with placement test scores below the threshold required for college level courses. Services and courses for pre-college-ready students include ESOL (English for Speakers of Other Languages), Adult Basic Education (remedial, pre-high-school level coursework), and Developmental Education (coursework for high school graduates who are not proficient in reading, writing and math skills at the college entrance level).

Transfer student
A community college student who has taken coursework equivalent to the first two years of a four-year university, and is qualified to enter at the third year of course work towards a bachelor's degree.

Undergraduate
Post-high-school education learning to an associate (two-year) or baccalaureate (four-year, bachelor's) degree.