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A multi-method examination of landscape studio problem-solving pedagogy as scholarly work on teaching and learning literature

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2015
Abstract

This study examined how the landscape studio has supported scholarly problem-solving pedagogy. Examination was limited to studio-educators’ published pedagogical research on problem-solving topics and on landscape architecture students’ preferences for solving studio-based problems. A unique multi-method research approach was used to assess the scholarly rigor and breadth of 467 academic articles published between 1997 and 2008 in Landscape Journal, Landscape Research, and Landscape Review. Scholarly rigor was assessed using Boyer’s model of scholarship, Cross and Steadman’s multiple scholarships of teaching, Weimer’s scholarly work on teaching and learning, and Groat and Wang’s architectural research methods. Content analysis was used to catalogue the breadth of problem-solving tools, techniques and theories mentioned in the articles. Research questionnaires, one-on-one interviews, focus groups and formal project presentations surveyed students’ problem-solving preferences. Seventy-eight first and final year students at Edinburgh College of Art, Scotland and Washington State University, United States participated. Data were tested to determine whether what studio-educators claimed in the articles were supported by landscape students’ preferences for solving studio-based problems.

Results found 56 articles possessed characteristics of scholarly work on teaching and learning and advanced problem-solving knowledge. Twenty-two different problem-solving tools, techniques or theories were mentioned in the articles. Students independently reported a preference for using 20 of the 22 problem-solving approaches. Strongly shared approaches involved cultural awareness and site visits. Approaches recommended by educator-authors, but not preferred by students, involved the environment, teamwork and innovation. Further research may be needed to explain these differences.

In conclusion, the landscape studio has supported scholarly problem-solving pedagogy through studio-educators’ pedagogical research published in discipline-based journals and students’ preferences for solving studio-based problems. This study is significant in its use of multi-method approaches to examine scholarly research and teaching. In the future, educator-authors may use information contained in this study to strengthen their teaching and scholarship.
I hereby declare that I am the sole author of this thesis; that the following thesis is entirely my own work; and that no part of this thesis has been submitted for another degree or qualification.
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1 Introduction

1.1 Statement of purpose
The purpose of this study was to better understand how the landscape studio has supported scholarly problem-solving pedagogy through the publication of academic articles and students’ use of problem-solving tools, techniques and theories in the landscape studio.

1.2 Focus of the study
During the late 1990s and early 2000s several journal editors and scholars of landscape architecture (Selman, 1998) (Thwaites, 1998) (Erdman, 2001) were interested in advancing the scholarly rigor of pedagogical research in the landscape studio. Academic articles from this time period focused on ways to prepare the next generation of landscape architects to solve complex cultural and environmental problems. A series of editorials in landscape journals made evident the link between design, teaching and scholarship in landscape architecture. This link was reinforced by John F. Benson in his article: On research, scholarship and design in landscape architecture. Benson found that landscape architecture faculty, when tasked with advancing their body of problem-solving knowledge, made explicit their studio-based research through academic articles (Benson, 1998). But a glitch existed. Although much studio-based research within the discipline of landscape architecture involved teaching, teaching was not considered a viable form of scholarship by the academy. This study documented an aspect of the situation and made recommendations for ways to generate more robust scholarship by using both teaching and research.

In contrast to the situation in the discipline of landscape architecture, teaching was supported as a viable form of scholarship by educational research scholars affiliated with The Carnegie Foundation for the Advancement of Teaching. These educational research scholars (Boyer & Mitgang, 1996) (Cross & Steadman, 1996) (Weimer, 2006) challenged practice-based teaching faculty to conduct more rigorous pedagogical research. To assist in this challenge, they recommended methods of conducting and assessing pedagogical research. Their recommendations provided a stable source of reference for this study.

The discipline of landscape architecture deals with solving spatial temporal problems. This is accomplished through locating “objects and activities in space and time” (Lynch & Hack, 1998, p. 1). Teaching and learning to solve problems takes place in the landscape architecture studio, where opportunity exists for students to identify, explore and resolve problems. As
students gain confidence, these skills are applied to more complex cultural and environmental problems set within the confines of the landscape studio.

In the landscape studio, equal opportunity exists for design studio educators to conduct pedagogical research and to publish their scholarly findings or personal reflections on studio activities in discipline-based literature. This type of research is important when advancing the body of problem-solving knowledge. Studio educators are well suited for this task, since many have gained their wisdom from professional practice.

Over the years, these pedagogical research activities have contributed to the design studio becoming a primary context for generating and disseminating pedagogical problem-solving knowledge. Still, there has been concern by some landscape architecture journal editors and scholars that pedagogical problem-solving knowledge generated in and disseminated from the studio is scholastically weak. Concerns have focused on design educators’ personal reflections on studio activities, known as Wisdom of Practice literature (Weimer, 2006) and on the apparent lack of synergy amongst publishing scholars who share common interests, but lack sufficient numbers necessary to support robust discourse in the literature (Berger, et al., 2003a). A question needs to be asked; how do scholars assure that the body of pedagogical problem-solving knowledge generated in and disseminated from the studio has advanced the way students solve complex cultural and environmental problems?

This question recognizes that communicating pedagogical knowledge has been a key component in advancing professional training. What may be lacking is scholastically rigorous discourse among design educators interested in teaching students to solve problems. Kristina Hill is a proponent of the design studio being a primary source of professional training for landscape architecture students. She has claimed, “design studio courses are the backbone of a bachelor's degree program in landscape architecture and allow students to apply theories and principles of landscape architecture to their own projects” (Hill, 2010, p. 1). Hill has recommended that one way to assure problem-solving knowledge is advanced, is to make studio courses transparent. This may be accomplished through studio-based teaching or research; better yet, problem-solving knowledge may be advanced through pedagogical research. The focus of the study was to examine how problem-solving knowledge has been communicated via literature and whether it has benefitted students in landscape studios. The baseline of data might then be used to identify guidelines for advancing studio educators scholarship.
1.3 Background

Over the years, the discipline of landscape architecture has transitioned from a practice-based discipline to an academic one. In part, this was the result of a mandate within higher education requiring scholars in both academic and practice-based disciplines to generate and disseminate robust scholarship in their areas of expertise (Boyer & Mitgang, 1996). This directive has affected the way scholars in practice-based disciplines in the United Kingdom, Canada, Australia, and the United States conduct and assess their scholarly work. For some scholars in the discipline of landscape architecture, the mandate for generating and disseminating robust scholarship has led to “a new interest in discovery research, and in the refereed article” (Barnett, 2000, p. 25). The application of theory to practice-based research and the offering of new peer-reviewed journals have accompanied this interest in scholarship.

For other scholars and teaching faculty, the mandate has led to more robust forms of pedagogical research. But for design educators, especially academic practitioners not trained to conduct or disseminate academic research, finding ways to conduct robust academic scholarship is becoming an urgent problem. Identification of this problem is based on a body of opinion that perceives scholarly work conducted by academic practitioners to be less scholastically robust than work conducted by scholars with advanced degrees. It is complicated by the fact that academic practitioners may be serving as adjuncts and therefore are not held to the same standards as tenure track faculty who are required to publish academic research as well as teach.

The researcher would suggest there may be a potential long-term problem with this scenario in the design studio. The reason being, academic practitioners are well trained to understand the studio culture, thereby well suited to conduct pedagogical research that advances studio teaching and learning practices. Scholars who have invested time in earning advanced design degrees rarely understand the studio culture from a practitioner’s point of view, but possess research expertise. To bridge the gap, academic practitioners need to be presented with viable ways to conduct academic scholarship in the studio. One would hope the result might be more robust forms of pedagogical studio-based research conducted by informed academic practitioners.

Pressure has been “placed on landscape architecture educators to publish more research, in addition to teaching design” (Bowring, 1997, p. 54). Promotion and tenure policies, while institution based, still possesses similar characteristics across all institutions of higher
education. The result being that pressure to publish comes from both the international academy and from within the discipline. It has motivated certain studio-based educators to advance the body of problem-solving knowledge, while at the same time meeting the mandate within higher education to generate and disseminate robust scholarship in their area of expertise. Kathryn Moore has published ways to train landscape students to be competent problem-solvers (Moore, 2006). Hargrove has assessed students’ abilities to solve problems based on their metacognitive skill development (Hargrove, 2007). Studio-based educators and educational scholars have included pedagogical problem-solving topics in their discussions on design as research (Armstrong, 1999) (Berger & Corkery, 2003), as well as in their discussions on teaching as research (Olsen & Simmons, 1996) (Selman, 1998) (Bass, 1998) (Thwaites, 2003). While these discussions have yet to achieve consensus, they have provided studio-based educators with a forum for making explicit the academic work that denotes their areas of expertise. More importantly, their discussions have exposed a need for better understanding how the landscape studio has supported scholarly problem-solving pedagogy through the publication of academic articles and students’ studio-based learning experiences.

1.3.1 Pedagogical research gains scholarly credibility

Scholarly discourse has been considered essential to the meaning-making, knowledge building process that has advanced the body of pedagogical problem-solving knowledge in the landscape studio. For years, studio educators have published in academic articles as a way to reflect on course success, to discuss ways to enhance their students’ learning processes, to introduce new problem-solving tools, techniques and theories, to ponder solutions to complex cultural and environmental problems, and to fill in gaps between students’ novice abilities and experts’ professional needs. However, these are the very types of academic articles journal editors have tended to recall for lack of rigorous standards (Berger & Corkery, 2003). Editors of landscape journals consider the lack of robust scholarly discourse to be a problem. Coupled with the mandate from higher education to advance all forms of scholarly research, studio educators and academic practitioners need ways to combine their teaching and research into recognized scholarly endeavors. This opportunity to combine teaching and research was first recognized by Ernest L. Boyer in the late 1980s. Boyer addressed the previous lack of rigorous research standards by suggesting the act of teaching be considered research. Much of this study focused on the consequences of Boyer’s expanded definition of scholarship as it related to pedagogical research in the landscape studio.
Interestingly, Weimer has argued that pedagogical research has value to a wider audience of educators when rewritten to be generalizable, transferable or replicable. These articles hold value as scholarly work on teaching and learning literature. Weimer has referred to these articles as Wisdom of Practice literature. Weimer, “along with Schön (1995) and others… believe in the legitimacy and relevance of experience-based knowledge” (Weimer, 2006, p. 54). Identifying academic articles having characteristics of scholarly work on teaching and learning literature became a focus of this study.

As more studio educators have published their research, pedagogical literature has gained scholarly credibility. This has been important, for the reason that “educators’ individual studio experiences are not considered as scholastically rigorous as generalizing the experience” (Selman, 1998, p. 195). This has been an issue when educator-authors have published thoughts on their personal teaching experience or on a one-off service-learning project (Weimer, 2008). Weimer refers to these experience-based articles as wisdom of practice literature. Personal wisdom gained from teaching has proven to be helpful when shared with colleagues, but it has not always been generalizable. One purpose of this study was to examine previously published academic articles to identify characteristics of scholastically robust wisdom of practice knowledge. This way, a baseline of exemplars might be identified, along with standards for conducting future wisdom of practice literature.

1.4 Indicating a gap

While it was common to find academic articles that described ways to solve spatial temporal problems, few articles discussed how problem-solving knowledge was being transferred from studio educator to student in the landscape studio. This gap made it challenging to build new pedagogical problem-solving knowledge. While some academic articles discussed the quality of pedagogical research, few guidelines were found to assist prospective researchers who might be interested in conducting and disseminating scholastically robust pedagogical research. This gap in research acumen made it challenging for novice studio educators to author scholastically robust pedagogical research. While many academic articles discussed using pedagogical problem-solving tools, techniques or theories in the landscape studio, a comprehensive list of these approaches appeared to be absent from discipline-based literature. This lack of information frustrated the understanding of how new problem-solving knowledge was being generated and disseminated. Finally, there was a gap that needed to be examined between studio educators’ recommended approaches to solving problems, found in
the academic articles, and students’ preferences for actually identifying, exploring and resolving studio projects. Addressing these gaps were valuable to answering how the landscape studio has supported problem-solving pedagogy in the past.

1.5 Motivation for this study

The researcher of this study believes that landscape architecture students, once professionals, will be called upon to identify, explore and resolve complex problems not yet thought of… (Braungart & McDonough, 2002). For this reason, training students to be competent problem solvers is vital to the success of our discipline and to the health of our twenty-first century communities. Studio educators must work to advance the body of problem-solving knowledge by making explicit new pedagogical research on problem-solving topics. This may require bridging the gap between research, education, and professional practice. Fortunately, we are able to learn from best practices how to strengthen the role of teaching within landscape studio programs, assure scholarly rigor of our pedagogic research, and provide strong journalistic mechanisms for sharing problem-solving knowledge across allied disciplines. This may involve new knowledge garnered from outside the discipline of landscape architecture, including educational scholars affiliated with the Carnegie Foundation for the Advancement of Teaching. This researcher believed that through the act of cataloguing our existing body of pedagogical problem-solving knowledge, we could begin to identify innovative approaches to studio-based teaching and learning that might, until now, have gone unnoticed. Likewise, this researcher believed that studio educators have the power to transform studio education through the publication of robust pedagogical scholarship. In turn, published pedagogical scholarship has the power to impact students in positive ways as they train to be creative problem solvers in the landscape architecture profession. These were the researcher’s beliefs that provided the basis for this study.

1.6 Objectives for this study

There were key objectives of this study. One objective was to identify academic articles authored by studio educators that discussed problem-solving topics. A second objective was to determine whether these articles held pedagogical value. The third objective was to identify generalizable, transferable or replicable scholastic characteristics of published research used to transcend knowledge beyond the studio. A fourth objective was to catalogue the types of research used to conduct and disseminate pedagogical research. A fifth objective was to list all mention of problem-solving tools, techniques or theories found in the articles.
The sixth objective was to identify how students go about solving studio-based problems in the landscape studio. A seventh objective was to answer whether students were using educator recommended problem-solving tools, techniques or theories in their studio-based projects e.g., the ones published in the articles. The eighth objective was to identify gaps between the problem-solving tools, techniques or theories recommended by studio educators in the articles and those preferred by students in landscape studios. The final objective was to summarize how the landscape studio has supported scholarly problem-solving pedagogy.

To meet these objectives, the contextual framework for this study was built primarily on Ernest L. Boyer’s challenge to recognize teaching as a viable form of scholarship, Maryellen Weimer’s call for disciplinary review of scholarly work on teaching and learning literature, and studio educators’ interest in testing and reporting on pedagogically valuable problem-solving tools, techniques and theories used in the landscape studio. Finally, multiple research approaches were used to query students to determine whether they approached problem-solving in the same way as studio educators described teaching students to approach problem-solving in the academic articles.

1.7 Assumptions for this study

It was assumed this study would find evidence that the landscape studio has for many years supported scholarly work on developing tools, techniques and theories to train students to solve studio-based problems. These activities likely involved educators and students; hence there would be published records and personal accounts to investigate. Scholarly work by studio educators would have included the generation and dissemination of academic articles. These articles would likely have been used to inform colleagues of new problem-solving research or to share educator’s reflections on teaching in the landscape studio. It was assumed that studio-based pedagogical activities would have provided topics for academic conference proceedings that were generalizable and worthy of sharing with teaching faculty in disciplines beyond landscape architecture. The discipline of landscape architecture’s pedagogical research literature has been faced with a paucity of scholarly research\(^1\) on studio-based problem-solving pedagogy (Gobster, et al., 2010). Architecture was assumed to be the closest design discipline to landscape architecture, therefore, it would possess the most

\(^{1}\) See Gobster et al. 2.8.3
relevant cannon of literature to adopt when gathering previously published scholarly research on studio-based problem-solving pedagogy.

It was assumed that interdisciplinary collaboration in the landscape studio would be easy to identify in these articles. Likewise, conducting a convenience survey of landscape architecture students would lead to finding evidence that a particular cohort of students used problem-solving tools, techniques and theories similar to those recommended in the articles. Data gathered through this study would provide a balanced description of studio pedagogy at the turn of the twenty-first century. These assumptions directly influenced the research questions and the methods selected to gather data to answer the research questions.

1.8  **Hypothesis**
If the landscape studio has supported scholarly problem-solving pedagogy where students used problem-solving tools, techniques and theories deemed by studio educators to have educational value, then evidence would be found in peer-reviewed journal articles and in the studio teaching and learning environment.

1.9  **Research Questions**
The following research questions were asked to gather and assess data to determine whether the landscape studio has supported scholarly problem-solving pedagogy.

1.9.1  Research questions for academic articles – data set 1
1) Question 1: Has the landscape studio supported research on problem-solving tools, techniques or theories?
   a. What percentage of academic articles mentioned the use of problem-solving tools, techniques or theories?
2) Question 2: Has the landscape studio supported studio educators’ publication of scholarship of teaching literature?
   a. What percentage of academic articles qualified as scholarship of teaching literature?
3) Question 3: Has the landscape studio supported studio educators’ publications of scholarly work on teaching and learning literature?
   a. What percentage of academic articles qualified as scholarly work on teaching and learning literature?
4) **Question 4:** Has the landscape studio supported pedagogical research on problem-solving topics by using practice-based research methods?
   a. Were practice-based methods of research used to generate knowledge on pedagogical problem-solving activities taking place in the landscape studio?
   b. If so, what were the practice-based research methods?
5) **Question 5:** Has the landscape studio supported research on pedagogically valuable problem-solving tools, techniques or theories?
   a. What problem-solving tools, techniques or theories were specifically mentioned in the academic articles as having educational value and were used in the landscape studio or in association with a studio-based project?

### 1.9.2 Research question for students’ surveys – data set 2

6) **Question 6:** Has the landscape studio supported students’ use of pedagogically valuable problem-solving tools, techniques or theories to discover, explore, or resolve studio-based problems?
   a. What problem-solving tools, techniques or theories did students mention using to discover, explore, or resolve studio-based problems?

### 1.9.3 Research questions that involved both sets of data

These questions were used to determine whether what landscape studio-educators claimed in the academic articles was supported by evidence based on students’ reported use of problem-solving tools, techniques and theories in the landscape studio.

7) **Question 7:** What problem-solving tools, techniques or theories were mentioned in both sets of data?
8) **Question 8:** Were gaps evident between the recommended problem-solving tools, techniques or theories mentioned in the educator-authored articles and those used by students?
   a. If so, what were the gaps?

### 1.10 Multiple Research Approaches

Multiple research approaches were selected for the purpose of gathering data to answer how the landscape studio has supported scholarly problem-solving pedagogy.
Table 1 Selection of multiple research approaches for data set 1 and data set 2

<table>
<thead>
<tr>
<th>Data Set 1</th>
<th>Data Set 2</th>
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<tbody>
<tr>
<td>Neuendorf’s content analysis</td>
<td>Krippendorff’s key word protocol</td>
</tr>
<tr>
<td>Sorted articles based on &gt; discipline-specific and interdisciplinary</td>
<td>Sorted data based on &gt;</td>
</tr>
<tr>
<td>research methods of problem-solving</td>
<td>Problem-solving tools, techniques or theories preferred by landscape</td>
</tr>
<tr>
<td>Boyer's Models of Scholarship</td>
<td>students</td>
</tr>
<tr>
<td>Sorted articles based on &gt; discovery, integration, application and teaching</td>
<td></td>
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<tr>
<td>Cross and Steadman's Multiple Scholarships of Teaching</td>
<td></td>
</tr>
<tr>
<td>Sorted articles based on &gt; discovery, integration, application and teaching</td>
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<tr>
<td>Weimer's scholarly work on teaching and learning literature</td>
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<tr>
<td>Sorted articles based on &gt; literature authored by faculty in disciplines</td>
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<tr>
<td>other than education</td>
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<tr>
<td>Groat and Wang’s non-pedagogical research methods</td>
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<tr>
<td>Sorted articles based on &gt; definitions of seven architectural research</td>
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<td>methods</td>
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<td>Krippendorff’s key word protocol</td>
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<tr>
<td>Sorted articles based on &gt; Problem-solving tools, techniques or theories</td>
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<tr>
<td>recommended by studio educators in the literature</td>
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Table 1 was generated by the researcher. It illustrated how multiple research methods were arranged to provide scholastically rigorous sorting of two sets of data. These research methods helped gather data to answer the research questions listing in 1.9. Data analysis then led to better understanding of how pedagogical research has taken place in the landscape studio over the past two decades.

1.10.1 Research methods used for data collection and analysis of data set 1

1) Neuendorf’s content analysis was used to determine what percentage of academic articles mentioned the use of problem-solving tools, techniques or theories in their titles, abstracts or full text.

2) Boyer’s model of scholarship was used to determine what percentage of academic articles qualified as scholarship of teaching literature, as distinct from the scholarships of discovery, integration, and application. Cross and Steadman’s Multiple Scholarships of Teaching (MSoT) were used to further delineate types of discovery, integration, application and teaching taking place within the scholarship of teaching literature as defined by Weimer. This method was used to determine what percentage of articles qualified as scholarship of teaching literature. Cross and Steadman’s descriptions of multiple scholarships of teaching
further defined Boyer’s definition of Scholarship. Findings were later used to show a relationship to Weimer’s classification scheme.

3) Weimer’s classification scheme was used to identify characteristics of generalizable scholarly work on teaching and learning literature published in academic articles authored by academic practitioners and landscape studio educators.

4) Groat and Wang’s definitions of seven architectural research methods were used to identify practice-based non-pedagogical approaches, which studio educators have used to generate new knowledge about educational problem-solving activities taking place in the landscape studio.

5) Krippendorff’s open-ended key word protocol was used to identify problem-solving tools, techniques or theories mentioned by name in the academic articles as having educational value in the landscape studio. This

1.10.2 Research methods used for data collection and analysis of data set 2
A multi-method research approach was used to gather and triangulate key words and phrases to answer question 6. These approaches included a self-reporting research questionnaire, one-on-one interviews, focus groups, and observations of students’ formal project presentations. These research methods facilitated the researcher in identifying specific problem-solving tools, techniques and theories, which students preferred to use to discover, explore or resolve studio-based problems.

6) Krippendorff’s open-ended key word protocol was used to identify problem-solving tools, techniques or theories mentioned by students as having value to them when solving studio-based problems.

1.10.3 Research method used for analysis of both sets of data
Gay’s work with sequential mixed methods analysis (Gay, 1996) (Gay, et al., 2000) was used to link information gathered from multiple research approaches described in data set 1 and, or, data set 2. This included using key words to search for parities and gaps found in the two lists of problem-solving tools, techniques and theories in data set 1 and data set 2. This task was carried out to test whether what studio-educators claimed in their academic articles was supported by evidence from students’ reporting their preferred methods of resolving problems in the landscape studio.
1.10.4 Overview of methodology used for this study

This study used a multi-method research approach to gather data from two different sources. The first set of data examined the scholastic rigor and breadth of 467 academic articles published in three discipline-based journals Landscape Journal, Landscape Research and Landscape Review between 1997 and 2008. This study used a multi-method research approach that involved Boyer’s 1990 model of scholarship, Cross and Steadman’s 1996 multiple scholarships of teaching, Weimer’s 2006 classification scheme for assessing scholarly work on teaching and learning authored by faculty in disciplines other than education, and Groat and Wang’s 2002 definition of seven architectural research methods. Data set 1 built on definitional expansions to the term scholarship of teaching and traced intrinsic qualities of educator-authored pedagogical research. Studio educators’ disciplinary and interdisciplinary approaches for conducting pedagogical research were examined; their scholastically vetted problem-solving tools, techniques and theories were cataloged. Established protocols for assessing pedagogical rigor were tested.

Data set 2 examined how students resolve complex cultural and environmental problems in the landscape studio. This examination was accomplished using a multi-method survey of seventy-eight first and final year landscape students attending Edinburgh College of Art in 2006 and Washington State University in 2008. This study identified and cataloged students’ preferred ways of discovering, exploring and resolving studio-based problems and generated a list of students’ preferred problem-solving tools, techniques and theories. Parities and gaps were acknowledged between problem-solving approaches advanced by studio educators in the academic articles (data set 1) and those used by students in the landscape studio (data set 2). Finally, this study recognized the challenge for greater accountability on the part of studio-educators when preparing the next generation of landscape architect students to solve problems.

1.11 Limitations

This study was limited to clearly stated or observable studio-based activities. These involved activities related to teaching and, or, learning how to solve complex studio-based problems. Studio educators’ pedagogical research was examined only through academic articles, insofar as interviews with studio educators were not considered feasible. Academic articles reviewed for data set 1 were limited to those published between 1997 and 2008; the first year of data set 1 coincided with the year Boyer’s Scholarship Reconsidered was published. The final
year of articles examined for data set 1 coincided with this study’s completion of the students’ surveys for data set 2.

Interaction between the researcher and students was limited to administering the research instruments in the landscape studios. Only students’ preferences for solving problems through observable studio-based activities were examined. Issues concerning students’ learning styles (Kolb, 1984) (Kvan & Jia, 2005) or learning outcomes (Schön, 1987) were not within the scope of this study.

This study narrowed its focus to the landscape studio and did not make generalizations to the larger design studio, professional practice, or studios associated with other design disciplines. Any reference to problem-solving practices found outside the discipline of landscape architecture was intended to enhance or inform the body of problem-solving knowledge within the discipline of landscape architecture. Finally, this study did not include discussions of particular theories of landscape architecture. Reference to theory was limited to its mention in relationship to solving a problem; for that reason only, theory appeared in the data together with problem-solving tools and techniques.

1.12 Terminology

1.12.1 Academic Practitioner
For purposes of this study, an academic practitioner was most often identified in the role of the studio educator. The term academic practitioner was used by Weimer to refer to faculty who teach practice-based knowledge within their department but have no formal higher educational training as a teacher. Academic practitioners are rarely trained as scholars, rather they are professionals who actively participate in the academe and often practice in a professional capacity in the community (Weimer, 2006). In landscape architecture, academic practitioners are dedicated to training the next generation of professionals through empirical problem-solving activities in the design studio (Seymour, 2008). Although highly skilled at communicating practice-based knowledge to students in the studio, they seldom take time to report pedagogical experiences, opinions, or findings in the professional literature. Their practice-based knowledge is vital in the training of landscape architecture students. However, in many schools in the United States, Canada and the United Kingdom the commonly held practice of hiring academic practitioners to teach studio courses has been shifting in favor of hiring academically trained faculty. In response, there is an urgent need to identify and
encouraged new ways to document academic practitioners’ studio-based problem-solving knowledge.

1.12.2 Carnegie Foundation for the Advancement of Teaching
Carnegie Foundation for the Advancement of Teaching (CFAT) is an independent policy and research center advancing the scholarship of teaching and learning by bringing together scholars, practitioners, and designers in new ways to solve problems of educational practice.

1.12.3 Carnegie Academy for the Scholarship of Teaching and Learning Program
Carnegie Academy for the Scholarship of Teaching and Learning Program (CASTL) was built on the concept that teaching is scholarly work. As such, “the CASTL program promotes “scholarship,” as an activity that is made public, is subject to peer review, is evaluated, and made accessible for exchange and use by members of one’s disciplinary community” (Shulman, 2011, p. 4). The CASTL Program assists professional disciplines transitioning to academic disciplines in three ways. First, they identify topics that “foster significant, long-lasting learning for all students; second, they advance the practice and profession of teaching; and third, they bring to teaching the recognition afforded to other forms of scholarly work” (Hutchings & Shulman, 1999, p. 10).

1.12.4 Case study
Johansson built on Groat and Wang’s definitional use of case study, suggesting it was the connecting meta-method that combined qualitative and quantitative research approaches in the landscape studio. Johansson argued “the case study has a special importance… within professional practice… based on knowledge of a repertoire of cases. A designer’s work is based on comparisons between known cases from the repertoire and the actual design situation (Schön 1991)” (Johansson, 2003, p. 4). Johansson developed his argument in part based on Robert Stake’s (Stake, 1998) work. Stake suggested the “case study may be defined by interest in individual cases” (Johansson, 2003, p. 2). At a much broader scale, Olsen and Simmons built on Meyers and Jones work, defining the case study as an important studio-based activity, alongside “problem-solving exercises, cooperative student projects, informal group work, simulations,… and role playing” (Meyers & Jones, 1993, p. 192).

1.12.5 Council of Educators in Landscape Architecture
“The Council of Educators in Landscape Architecture (CELA) is composed of virtually all the programs of higher learning in landscape architecture in the United States, Canada,
Australia and New Zealand. CELA publishes the highest quality research conducted in the profession through its refereed publication, *Landscape Journal*” (McCown, 2014, p. 1).

1.12.6 Design process
Donald A. Schön described protocols of critical thinking and action used by designers when they design. He described “the approach taken… toward problem identification, concept/idea generation, and design resolution” (Schön, 1983, p. 374). Schön’s description codified the design process for the discipline of architecture. Similarities exist in the way landscape architects approach the design process.

1.12.7 Design studio educator
For purposes of this study, it was assumed that a design studio educator held an advanced degree in landscape architecture or an allied discipline and served an internship in a professional office. This study did not distinguish between educators who were or were not registered landscape architects.

1.12.8 Discipline
This study used the definition of discipline published by Carolin Kreber. She said that a discipline “in a sense is not just a body of knowledge but a set of conceptual and methodological tools employed in creating and critiquing this knowledge” (Kreber, 2009, p. 11).

1.12.9 Ill-defined problem
Ill-defined problems are more likely discussed in interior design literature where they are recognized as “a condition where the design student is required to identify his or her plan to solve the problem, set parameters for their exploration, and provide one or more solutions” (Davey, 2008, p. 69). Put another way, psychologist Thomas C. Ormerod defined an ill-defined problem as “a description lacking a concrete and visible goal-state” (Ormerod, 2004, p. 2).

1.12.10 Interdisciplinary studio
The interdisciplinary studio was defined as an educational venue “involving several unrelated academic disciplines in a way that forces them to cross subject boundaries to solve a common research goal” (Selman, 2003, p. 458). In a similar way, interdisciplinary research programs “integrate diverse perspectives of multiple fields and facilitate the translation of research
findings into practical guidelines for effective landscape design and management” (Stokols, 2011, p. 1).

1.12.11 Multidisciplinary studio
A multidisciplinary studio was defined as one that promotes work with “biological, physical, social, and cultural elements of landscape (which often proceed in parallel yet isolated fashion)” (Stokols, 2011, p. 1). From 1996 on, Patricia Cross and Mimi Harris Steadman have built on Multiple SoT (Cross & Steadman, 1996).

1.12.12 Problem
According to Randy Bass, the definition of a problem may be seen as a dichotomy. “In scholarship and research, having a "problem" is at the heart of the investigative process; it is the compound of the generative questions around which all creative and productive activity revolves. But in one's teaching, a "problem" is something you don't want to have, and if you have one, you probably want to fix it” (Bass, 1998, p. 1).

1.12.13 Problem-solving
Problem-solving in the discipline of landscape architecture has been defined as the act of locating “objects and activities in space and time” (Lynch & Hack, 1998, p. 1). On the other hand, “education and scholarship are the ways our species copes with the challenge of learning to live in, with and on behalf of the world. Since the world is forever changing, this provides us with unlimited opportunities for exploration” (Shulman, 2011, p. 6).

1.12.14 Problem-solving process
According to Harnad, “problem-solving involved applying a known rule or ‘algorithm’ in order to solve problems of an overall type that varied in a minor or predictable way” (Harnad, 1990, p. 19) (Solovyova, 2008, p. 5). This holds true in the design professions to some degree. Problem-solving may be seen as a “systematic approach to design that often converts ideas to products or systems for use in the industry” (Erdman, 2001, p. 18). However, the definition has changed over time. More recently, Lewis Elton declared that the “problem-solving process is no longer linear, it is three-dimensional,” (Elton, 2009). It has now taken on a role analogous to, if less structured than, the design process. This study recognized the definition of problem-solving processes continues to change.
1.12.15 Professional Education
Professional education was defined by Blauch as higher educational training for professional fields such as medicine and design, as opposed to academic professions such as science or history (Blauch, 1962).

1.12.16 Promising Possibilities
This is pedagogical research that takes into account “unique methods, hybrids, unusual formats, and other approaches to research” (Weimer, 2006, pp. 125-129).

1.12.17 Research Scholarship
This is pedagogical research “that discovers, that interprets, or that explores” (Weimer, 2006, p. 92). Research scholarship uses three forms of investigation: quantitative investigations, qualitative studies, and descriptive research.

1.12.18 Scholarship
Prior to 1990, scholarship was primarily viewed as “creative intellectual work validated by peers and communicated to those within their own discipline” (Kearns, 2010, p. 1). Scholars were required to conduct research and publish findings. Little time was reserved for other academic activities. Faculty who chose to invest time in teaching and service were not afforded the same recognition or opportunities as were research scholars when it came time for academic assessment, reward and promotion. After 1990, Lee Shulman was able to base a strong argument on Boyer’s Model of Scholarship. Shulman argued that to be called scholarship, a research activity had to “manifest three essential features: it should be public, subject to peer review and evaluation, and accessible for exchange and use by members of one’s disciplinary community” (Shulman, 2011, p. 4).

1.12.19 Scholarship of Teaching
Scholarship of Teaching (SoT) was one of four scholarships defined by Boyer in 1990 (Boyer, 1990). SoT deals with the transfer of domain-specific pedagogical knowledge. It may be described as a “student-focused activity-based learning in which inquiry becomes central” (Brew & Ginns, 2008, p. 535). Over the years, scholars have added to Boyer’s definition by means of descriptive aspects “(understanding, categorizing, defining and describing what teachers and teaching are) and purposive aspects (a means to an end, namely, the improvement of students’ learning)” (Trigwell, et al., 2000, p. 155). The vision of a scholarship of teaching is inherent in the work of CASTL, where teaching is scholarly work.
1.12.20 Scholarship of Teaching and Learning
The definition of Scholarship of Teaching and Learning (SoTL) includes; 1) discovery research on teaching and learning; 2) excellence in teaching as evidenced by teaching awards or evaluations of teaching; 3) reflection on and application of the work of educational researchers; and 4) reflection on practice and on research on teaching in the teacher’s own discipline (Kreber & Cranton, 2000) (Brew & Ginns, 2008) (Gentry, 2008). These activities advance the generation and dissemination of domain-specific pedagogical knowledge. This study relied heavily on the fourth component as described by Kreber and Cranton and later quoted by Angela Brew and Paul Ginns. Many institutions of higher education have “established programs to teach academics the skills of scholarly inquiry related to teaching and learning” (Brew & Ginns, 2008, p. 3). These programs have advanced the generation and dissemination of domain-specific pedagogical knowledge as well as more generalizable Scholarly Work on Teaching and Learning literature.

1.12.21 Scholarly Endeavor
Scholarly endeavor has been defined as academic work, whether discovery, integration, application, or teaching, that “asks questions and finds the best explanation” (Dohr, 2007, p. vii).

1.12.22 Scholarly Teaching
Scholarly teaching has been defined as an act of “making transparent how we have made learning possible” (Brew & Ginns, 2008, p. 535). This includes understanding that “teachers must be informed of the theoretical perspectives and literature of teaching and learning in their discipline, and be able to collect and present rigorous evidence of effectiveness” (Trigwell, et al., 2000, p. 156). Scholarly teaching “always draws on the fruits of scholarship and, to the extent that a teacher then transforms what he or she already knows into new representations that can help students make sense of the world, the teaching itself is scholarly… parallel to research, integration and application” (Shulman, 2011, pp. 3-4). Scholarly teaching is an act by which the teacher creatively builds bridges between his or her own understanding and the students' learning (Weimer, 2008). Finally, the definition recognizes that scholarly teaching does not require the sharing of findings (Mashek & Hammer, 2011).
1.12.23 Scholarly Work on Teaching and Learning literature

Weimer has defined Scholarly Work on Teaching and Learning (SWOTL) literature as pedagogical research authored by academic practitioners, or design educators, teaching in practice-based disciplines, like landscape architecture, who are not formally trained educators. SWOTL literature is similar to domain-specific SoT literature, but goes beyond the confines of the discipline and shares generalizable, transferable and, or, replicable pedagogic knowledge with a broader inquiring audience (Weimer, 2006). SWOTL literature is often useful when addressing issues that cross disciplinary boundaries. This is a common condition in interdisciplinary studios.

1.12.23.1 Teaching

Randall G. Bowden quoted Boyer’s 1990 definition of teaching in his journal article titled *Scholarship Reconsidered: Reconsidered* (Bowden, 2007); “teaching is… a dynamic endeavor involving all the analogies, metaphors, and images that build bridges between the teacher’s understanding and the student’s learning (Boyer, 1990, p. 23)” (Bowden, 2007, p. 2). Boyer argued that “the work of the teacher needed to be valued in higher education in a manner comparable to the work of a researcher” (Shulman, 2011, p. 3). Boyer understood that knowledge gained through teaching has the potential for being generalizable, while teaching, itself, has the potential for generating new domain-specific knowledge.

1.12.24 Wisdom of Practice

Faculty use the lens of experience to analyze instructional issues using four experimental approaches: “personal accounts of change, recommended practice reports, recommended-content reports, and personal narrative” (Weimer, 2006, p. front jack). Wisdom of Practice literature is known to be the scholastically weakest form of SWOTL literature as defined by Weimer.
2 Literature Review

2.1 Research mandate

In recent years, faculty in institutions of higher education have come under pressure to conduct and publish scholarly research. This may be a requirement for promotion and tenure, or part of advancing the scholastic standing of their research institution. Faculty frequently have complied with this mandate by selecting a discipline-specific research topic. For certain studio educators carrying high teaching loads, compliance has meant generating and disseminating research on studio-based activities. Some studio educators have selected to conduct research on problem-solving topics. Resulting pedagogical research has been recognized at conference proceedings and published in academic journal articles. Nevertheless, this form of studio-based research has caused debate within the discipline of landscape architecture with regard to its uncertain quality of scholarship and benefit to the discipline (Corkery, 2000) (Berger & Corkery, 2003).

Difficulty has arisen on two accounts. First, pedagogical research has long been considered the weakest form of research scholarship; lagging behind the scholarships of discovery, integration and application (Weimer, 2006). Much discussion has surrounded this topic, as there needs to be better ways to assess the scholarly rigor of pedagogical research being generated in and disseminated from the studio teaching and learning environment. Second, acquisition of problem-solving skills has long been considered intuitive rather than instructive. There is more than one interpretation for what this entails. Kathryn Moore has postulated that the acquisition of problem-solving skills may be considered intuitive rather than instructive (Moore, 2006). For Moore solving problems requires “visual skill, artistic sensibility, creativity, intuition, and imagination, qualities that are generally held to be insubstantial, if not insignificant, in comparison to the so-called linear, logical rationality of language and intelligence that is so much part of our culture” (Moore, 2006). Moore has debated in favor of utilizing intuitive things “in order to train landscape architect students to be responsible designers of public places and spaces” (Moore, 2006). Michael Seymour has expressed another opinion. He has found that educating design students required an understanding of process-based teaching. Seymour has said; “landscape students must be able to express their ideas graphically, verbally, and in written form, whether designing a project on their own or as a member of a multi-disciplinary team” (Seymour, 2008, p. 1). These represent opinions from two studio educators who have conducted research on problem-
solving topics. While studio educators have weighed in on this argument, they have yet to develop a comprehensive view of the whole of problem-solving acquisition.

There needs to be a better way of cataloging and sharing discipline-based problem-solving pedagogies, while at the same time developing new and innovative approaches for addressing complex cultural and environmental problems facing the profession and the world. Reading previously published pedagogical literature, it appeared every studio educator had his or her preferred solution to these issues. Some chose to ignore one or the other. Some chose to improve the situation by one or both means. It appeared that what was needed was a way to identify the issues collectively and to begin to build a consensus of knowledge unique to the landscape studio culture.

2.2 Researcher’s comments


The reader will note that while seminal work was mentioned, much of this literature review focused on related topics. The researcher determined it was necessary to apply a multi-faceted investigative lens to issues that have concerned editors and scholars of landscape architecture for years. The lens that best fit this task needed to promote teaching, as well as research. It needed to provide standards for scholarly discourse on the teaching of design and advance topics that are dependent on unique forms of pedagogy. It was evident after reading numerous comments by landscape architecture journal editors and scholars on these topics that they continue to seek new forms of scholarship to address complex issues related to

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² A list of shared problem-solving tools, techniques and theories may be reviewed in Table 44, Table 45, and Table 46.
studio-based pedagogical research. Applying the lens of knowledge from another discipline, the Scholarship of Teaching and Learning, provided a new way of viewing challenges facing teaching and research in the discipline of landscape architecture.

Many issues related to design studio education have been discussed through the interdisciplinary design journal, *Design Studies: The International Journal of Design Research*. This source was consulted. Because, teaching faculty in the discipline of architecture, a closely related design discipline to that of landscape architecture, have successfully dealt with issues related to studio-based teaching and research.

### 2.3 Overview of literature review

For purposes of this study, the literature review was conducted in five sections. The first two sections represent the focal theory; sections three through five represent the background theory. The first section of the literature review concentrated on research conducted by the Carnegie Foundation for the Advancement of Teaching (Boyer & Mitgang, 1996). An explanation of Boyer’s Model of Scholarship (Boyer, 1997) was presented. The definition of scholarship was expanded to include teaching. Cross and Steadman’s taxonomy of multiple scholarships of teaching was introduced (Cross & Steadman, 1996). Their taxonomy was defined more narrowly to include applications of discovery, integration, application and teaching that support scholarship of teaching style pedagogical research. By utilizing the above mentioned theories, this study was able to build on the definition of scholarship of teaching as it has been conducted in and disseminated from the design studio as scholarly work on teaching and learning literature.

The second section of the literature review discussed scholarly work on teaching and learning literature and examined its value in inciting academic rigor in practice-based disciplines. Weimer’s classification scheme for assessing scholarly work on teaching and learning literature authored by faculty in disciplines other than education was presented (Weimer, 2006). Weimer’s three categories of scholarly work on teaching and learning literature provide a means of accomplishing wider dissemination of pedagogical knowledge through Wisdom of Practice, Research Scholarship and Promising Possibilities literature (Weimer, 2008). Blossom and others have suggested that certain aspects of Promising Possibilities literature may be particular to the design disciplines (Blossom, et al., 2010). This study applied Weimer’s three categories of scholarly work on teaching and learning literature to the three internationally recognized landscape architecture journals. Then, considered whether
Wisdom of Practice, Research Scholarship or Promising Possibilities literature has played a role in advancing the body of studio-based problem-solving knowledge in the landscape studio.

Discussions by design scholars have stressed the importance of disseminating pedagogical problem-solving knowledge to a wider audience (Cross, 1999) (Cross, 2010). These discussions were led primarily by scholars from schools of architecture in the United Kingdom, who were inspired by Boyer’s writings in the early 1990s to enter into scholarly discourse on what became known as ‘design thinking’. The researcher considered that discourse on design thinking provided perhaps the closes relevant cannon to the issue of problem-solving. It was also the longest running discourse, as the discourse by landscape architecture scholars was sporadic at best. It was for this reason that several articles authored by architecture faculty were quoted in this study.

The third section of the literature review presented historical background including the three stages of professional education from the apprenticeship system (Blauch, 1962) to the academic design studio (Schön, 1983). A depiction of the studio learning environment was provided by Schön, who was the first educational researcher to describe the design process. Contemporary scholars in landscape architecture (Kearns, 2010), interior design and architecture, (Ehlen, 2012) (Davey, 2008) (Cross, 2010) have discussed the importance of generating and disseminating studio-based pedagogical research in discipline-specific and interdisciplinary studios. The third section of the literature review concluded with a discussion of the efficacy of architectural research methods (Groat & Wang, 2001) used to conduct pedagogical research. Based on work by these scholars, this study acknowledged the uniqueness of studio-based pedagogical research and the range of diverse research methods available to studio educators.

The fourth section of the literature review covered discussions by scholars and journal editors on the topic of the landscape studio teaching and research environment. The ongoing teaching versus research debate was argued in favor of research productivity being a positive influence on students (Olsen & Simmons, 1996). An alternate view was presented (Feldman, 1987). Design studio educators have often conducted pedagogical research on narrowly defined topics. One reason was based on efficiency; studio educators teach and conduct research in the landscape studio (Selman, 1998) (Birksted, 2003) (Jefferies, 2007). Another reason was studio educators desired to advance the body of problem-solving knowledge for their students
who aspire to be future practitioners (Armstrong, 1999) (Moore, 2001) (Seymour, 2008). Jacky Bowring mentioned the pressure “placed on landscape architecture educators to publish more research, in addition to teaching design” (Bowring, 1997, p. 54). For this reason, studio educators have conducted research on tools, techniques and theories used to train students to resolve complex cultural and environmental issues (Armstrong, 1999) (Moore, 2001) (Seymour, 2008). But with few studio educators contributing to discussions in the literature, journal editors report “it has been difficult at times for faculty to conduct rigorous scholarly discourse or to test and report on one another’s recommendations” (Berger & Corkery, 2003, p. 2). This study entered the discussion to examine the number of times educator-authors have responded to another article, published funded research, reported a new finding, or presented a challenge for the future.

The final portion of the literature review brought together conversations by studio educators and journal editors discussing the fate of academically weak articles submitted for publication (Berger & Corkery, 2003). It appeared that a new model of pedagogical scholarship would be welcome. For years, scholars have suggested that an effort to establish a research culture may depend on the discipline of landscape architecture revisiting its manifesto (Krog, 1981) (Hohmann & Langhorst, 2004). Some scholars still think this effort might be necessary to sort out theoretical deficiencies that limit intellectual discourse on pedagogical topics. Kevin Thwaites has stated “that there have been difficulties in landscape architecture – establishing a research culture” (Thwaites, 2003, p. 13). Paul H. Selman has recommended that faculty teaching design studios need to receive “proper research training or (take time) to discover the benefits of integrating self-critical inquiry with innovative design” (Selman, 1998, p. 196). Integrating self-critical inquiry with innovative design is what Donald A. Schön has described as reflection-on-teaching (Schön, 1987). Studio educators and journal editors have regarded the lack of a robust research culture as a problem to be solved through more academically rigorous scholarship. Weimer has responded with a solution. Her baseline of acceptable scholarly rigor may be used to evaluate previously published pedagogical articles or to screen new article submissions.

Regardless of the reason, lack of a robust research culture has been viewed as a problem. Academically weak articles have been one result. Weimer’s new model of assessing pedagogical scholarship might be a solution.
Landscape journal editors and studio educators have acknowledged a need for greater accountability when preparing the next generation of landscape architects to be competent problem solvers. According to Selman, remediing this impediment through rigorous pedagogical research efforts is vital to the discipline of landscape architecture gaining scholarly standing in the academe and vital to providing students with reliable problem-solving solutions to complex societal and environmental problems (Selman, 2003). Boyer, Weimer and others have provided scholastically robust ways of assessing the pedagogical research efforts of faculty in other practice-based disciplines. The time appeared right for doing the same within the discipline of landscape architecture. This effort paralleled Karl K. Jefferies comment in *Design Studies*. He wrote, “the potential to combine creativity diagnostic tools, and establish design pedagogy suggests a fruitful area of research, and one particularly relevant to the demands of contemporary higher education” (Jefferies, 2007, p. 495). The researcher of this study chose to enter this very relevant area of research. As result, this study focused on identifying characteristics of scholastically robust pedagogical research published in peer-reviewed academic articles. This study was conducted with the intention of establishing a baseline of existing robust pedagogical research authored by studio educators, which would benefit landscape journal editors and studio educators interested in generating more SWOTL literature. This is an area of interest that has been discussed in greater depth by architecture faculty than by landscape architecture faculty. For this reason, the literature review has included discussions by Nigel Cross and fellow architecture faculty interested in enhancing teaching and learning in the design studio.

2.4 Teaching as scholarly work

2.4.1 The Carnegie Foundation for the Advancement of Teaching

The Carnegie Foundation was founded by philanthropist Andrew Carnegie in 1905 and chartered in 1906 by an act of the United States Congress. Since 1997, it has been an independent policy and research center advancing the scholarship of teaching and learning by bringing together scholars, practitioners, and designers in new ways to solve problems of educational practice. In this new role, The Carnegie Foundation has called for all practice-based disciplines in higher education to assess the scholastic rigor of their teaching and learning literature (Walker, et al., 2008).

Assessment of existing forms of scholarship has been viewed as a necessary step in advancing all forms of scholarship in practice-based disciplines. In the past, scholars were
required to conduct research and publish findings, leaving little time reserved for other academic activities. Faculty who chose to invest time in teaching and service were not afforded the same recognition or opportunities as were research scholars when it came time for academic assessment, reward or promotion. With guidance from The Carnegie Foundation, it was anticipated that more robust pedagogical research would be generated in all practice-based disciplines. This expectation was of particular interest to studio-educators in the discipline of landscape architecture, who were interested in establishing a framework for advancing their studio-based research practices.

2.4.2 So what?
The call for more robust pedagogical research stemmed from a movement that began in the United States in 1990 by then Carnegie Foundation President Ernest L. Boyer. Working closely with Eugene Rice, the two men published a report on findings from a twenty-five year study on the condition of 5,000 faculty teaching in higher education in North America. Findings in *The Condition of the Professoriate: Attitudes and Trends* showed that over 70% of faculty said their interests lay in teaching, and a significant percentage concluded that “teaching effectiveness should be the primary criterion for promotion” (Boyer & Rice, 1989, p. 2). Moreover, faculty overwhelmingly said they enjoyed interacting informally with undergraduates outside the classroom and most rejected the notion that students should seek faculty help during posted office hours only. Clearly, the majority of faculty who participated in the Boyer and Rice report considered teaching to be a central mission and enjoyed the time they spent with students. Alas, most faculty at four-year institutions reported that the reward system was heavily weighted toward published research, not effective teaching; more than one third of these faculty supported the proposition that “at their institutions, publications were ‘just counted, not qualitatively measured. Even at research universities, a surprising 42% of faculty agreed with this conclusion” (Boyer & Rice, 1989, p. xx). From these findings, Boyer and Rice concluded:

“What we need, then, in higher education is a reward system that reflects the diversity of our institutions and the breadth of scholarship, as well. The challenge is to strike a balance among teaching, research, and service, a position supported by two-thirds of today’s faculty who conclude that, “at my institution, we need better ways, besides publication, to evaluate scholarly performance of faculty” (Boyer & Rice, 1989, p. xxi).

The concepts presented by Boyer and Rice seemed timely. They were right.
2.4.3 Scholarly discourse

“The Condition of the Professoriate provided the foundation for the wide-ranging debate waiting to be held between research and teaching” (Glassick, 2000, p. 877). It also provided fuel for the more specific debate within the design disciplines inquiring if design is research or if research is design? It was in this context that The Carnegie Foundation for the Advancement of Teachers entered the discussion, presented a succinct assessment of the situation, provided a framework for advancing the discussion and challenged parties immediately involved to respond.

The time was right. Scholars throughout higher education were searching for ways to fairly evaluate scholarly performance of faculty. One way (and a major focus of this study) was through enhancing scholarly discourse. Academic articles were known to foster discovery and extend domain-specific knowledge beyond previously known boundaries. In academic disciplines it was customary to publish empirical research methods as well as new theoretically driven knowledge. Both approaches have been readily disseminated via conference papers and peer-reviewed publications requisite for tenure and sustaining disciplinary rigor (Pan, 2004). But evaluation based on research papers and publications was problematic for teaching and design faculty who typically spend more of their time teaching than on research activities.

Educational scholars have maintained that teaching is reliant on characteristics of specific disciplines (Huber & Hutchings, 2005) (Braxton, et al., 2002). As a result, teaching has yet to be clearly defined. Matthew G. Jones suggested this situation exists because, “teaching is often an isolated activity, with experience and intuition the only sources to spur improvement” (Jones, 2008). Lee S. Shulman has suggested this form of isolation might change, if research activities were made inclusive. His formula for success follows; robust research “manifests three essential features: it should be public, subject to peer review and evaluation, and accessible for exchange and use by members of one’s disciplinary community” (Shulman, 2011, p. 4). In this way, characteristics of specific disciplines’ teaching methods have been made generalizable to a wider audience.

In the design disciplines, it has been customary to find new innovative knowledge used to solve complex problems being disseminated first through the design studio learning environment, then through conference papers. Knowledge gained in the studio is seldom generalized or shared with a broader inquiring audience outside the design disciplines; even
though, discovery and the extension of domain-specific knowledge depend on scholarly
discourse to bridge the gap between pioneering knowledge and teaching. George E. Walker,
director of the Carnegie Initiative on the Doctorate at The Carnegie Foundation for the
Advancement of Teaching, has suggested there is evidence this trend is changing. A review
of recent literature suggests this change is, in part, due to continuing work by scholars at The
Carnegie Foundation for the Advancement of Teaching. Building on Boyer’s work, Carnegie
Foundation scholars have been encouraging faculty in institutions of higher education to
place more emphasis on their teaching research.

2.4.4 Ernest L. Boyer – wisdom gained from teaching
Ernest L. Boyer entered the teaching ‘versus’ research debate taking place in institutions of
higher education with his report: Scholarship Reconsidered: Priorities of the Professoriate
(Boyer, 1990). Through his research, Boyer argued that “the dichotomy between research and
teaching is false, because there were multiple forms of scholarship, not just the form that
produces new knowledge through laboratory breakthroughs, journal articles or new books”
(Jaschik, 2005, p. 1). Boyer had found faculty in many academic disciplines dedicated to
teaching. He acknowledged their wisdom gained from teaching. After much consideration, he
went so far as to expand the definition of scholarship to include teaching. Thereby, validating
teachers’ ideas. Weimer described Boyer’s position.

“Pedagogical scholarship does not look like scholarly work done in most of
the disciplines, even though its format and structure may mirror the
protocols and conventions of the field. It is more applied, more pragmatic,
not all empirical, and mostly not discovery-based. As such, it is
disenfranchised and devalued when discipline-based research standards are
used to assess it. This is why it is important to understand this type of
scholarly work—so it can be appreciated for what it is, and... advanced...
enhanced... made more scholastically rigorous to be made more
scholastically credible, more valuable, advance the discipline and provide
for the profession, and assist in faculty tenure and promotion” (Weimer,

Boyer defined pedagogical scholarship as “scholarly work completed by faculty in disciplines
other than education” (Weimer, 2006, p. 21). He went on to suggest what was needed was to
allow academic practitioners parity with faculty conducting traditional research.

Boyer proposed a broader definition for the term scholarship, as one “that brings legitimacy
to the full scope of academic work” (Boyer, 1990, p. 16). This expanded definition of
scholarship involved four areas critical to academic work. These were published in A Special
Report, Scholarship Reconsidered: Priorities of the professoriate (Boyer, 1990). The four areas comprised:

“Discovery, where new and unique knowledge is generated,

Application, where the emphasis is on the use of new knowledge in solving society's problems,

Integration, where new relationships among disciplines are discovered, and

Teaching, where the teacher creatively builds bridges between his or her own understanding and the students' learning” (Weimer, 2008, p. 3).

These four definitions of scholarship were to be known as Boyer’s Model of Scholarship (Boyer, 1997). Boyer’s Model of Scholarship has been diagrammed to denote stability and equality.

*Figure 1* Four functions of scholarship based on Boyer’s Model of Scholarship

To understand the value of pedagogical research, it must be placed within the larger context of Boyer’s challenge. Boyer’s Model of Scholarship offered a new perspective to design faculty who faced particularly problematic career paths in institutions of higher education that relied solely on research standards as evidence of productivity (Boyer, 1990). Figure 1 showed teaching as part of the cycle of research discovery followed by integration of new knowledge across disciplines and application of said knowledge in society. Teaching prepared researchers to make discoveries through generation of new knowledge. Teaching also integrated new knowledge across disciplines and applied it to issues in society. As well as the role of teaching Boyer’s expanded definition meant that scholarship could now be
conducted by faculty whose time was dedicated to teaching. Boyer and colleagues worked closely to establish a foundation for this new form of academic work.

Boyer and Eugene Rice understood that the quality of undergraduate education was dependent on the existence of rigorous pedagogical scholarship. They recognized the value in practitioner-authored pedagogic literature; what this study will refer to as, academic articles authored by studio educators. The result was a broader definition of scholarship “encompassing not only basic research but integrative and applied work, as well as the work of teaching” (Boyer & Rice, 1989, p. xxi). The value of this decision has been evident in an expansion of scholarly work and design thinking conducted by faculty in the design disciplines (Cross, 1999) (Cross, 2010), especially through publications in Design Studies, Journal of Architectural Education, Journal of Interior Design, Landscape Architecture and Landscape Review. Design faculty were now free to share ideas among the professoriate by discussing undergraduate education, core curriculum, and prize teaching as scholarly work.

Gobster et al., reported that established scholars in landscape architecture, who produced the largest number of refereed publications, held Ph.D.’s in allied disciplines such as Environmental Planning and Design, Urban and Regional Planning, Geography, and Architecture (Tai, 2003) (ASLA, 2011). This may help explain why some rigorous pedagogical scholarship research has been published outside traditional landscape architecture journals.

Teaching was the only scholarship described by Boyer that shared some reporting with all other scholarship types: discovery, integration, and application. This was a significant point, as it helped to strengthen the argument for rigorous design studio pedagogy (Blossom, et al., 2010, p. 10).
Figure 2, developed by the researcher, showed teaching was placed central in Boyer’s scheme, because teaching shared some reporting with each of the other scholarship types. Boyer challenged all disciplines to embrace this new understanding of research and move beyond an exclusive focus on traditional and narrowly defined research as the only legitimate avenue to new knowledge within their discipline. With this challenge, Boyer started the revolution known as the Scholarship of Teaching.

Boyer died in 1995. The next year Boyer’s colleague, Lee Mitgang, oversaw publication of *Building Community: A New Future for Architecture Education and Practice* (Boyer & Mitgang, 1996). This report contained Boyer’s initial thoughts on, and work with, the design disciplines. It was left to Carnegie Foundation scholars and their affiliates to continue Boyer’s work of defining good teaching and the role of pedagogical scholarship.

In response to Boyer’s challenge, all forms of teaching were considered a type of scholarship. In the early 1990’s, design faculty began in earnest to promote design thinking in the undergraduate design studio. They recognized that teaching design thinking involved understanding the problem-solving process. Their pedagogical focus was strongly linked to undergraduate design studio education in architecture, interior space planning, industrial design and landscape architecture. Interested faculty met annually in the United Kingdom. They participated in symposiums and frequently published in the journal *Design Studies*. Design faculty linked their teaching with the process of discovery; thereby training their undergraduates to conduct meaningful discovery-based research. They provided opportunities
within the larger community for their students to apply new knowledge; thereby reinforcing
their students’ hands-on-learning experiences. They integrated knowledge from outside their
primary discipline to train students to solve complex problems.

2.4.5 Deborah Olsen and Ada Simmons
Deborah Olsen and Ada Simmons built on Boyer’s work. They found that the relationship
between research productivity and teaching had to do with several things: “time, energy,
salary, additional financial incentive, prestige, and personal inclinations to cultivate faculty-
student interaction” (Olsen & Simmons, 1996, p. 31). Interestingly, their findings suggested
teaching faculty would benefit from mastery of ‘active learning techniques’. These activities
were defined by Chet Meyers and Thomas B. Jones as problem-solving exercises,
cooperative student projects, informal group work, simulations, case studies, and role
playing. By tradition, the active learning techniques mentioned by Meyers and Jones are
found in the landscape architecture studio. For years, their presence has provided studio
educators opportunities to contribute valuable insights to scholarly discourse taking place
beyond the limited audience of design studio educators.

2.4.6 Charles E. Glassick – six standard measurements
Following Boyer’s death, Charles E. Glassick was appointed senior associate of The Carnegie
Foundation. He, along with Mary Taylor Huber and Gene Maeroff, suggested six standard
measurements for determining the quality for each of Boyer’s four types of scholarship.
Standard measurements for quality required “evidence that scholars have set clear goals,
allowed for adequate preparation time, used appropriate research methods, achieved
significant results, communicated results in effective ways, and reflected on their own
scholarly work” (Glassick, et al., 1997, p. 10). These standards are used to evaluate the
quality of scholarship at every level of education and applied to all four forms of scholarship.
As interest in scholarship of teaching grew, new opportunities to conduct and disseminate
pedagogical research became available to the Carnegie Foundation.

2.4.7 Carnegie Academy for the Scholarship of Teaching and Learning Program
In 1998, the Carnegie Academy for the Scholarship of Teaching and Learning Program
(CASTL) was launched to build on the concept of teaching as scholarly work. This program
has been recognized throughout higher education for providing faculty, who teach in
professional disciplines outside the discipline of education, with strategies for enhancing their
teaching practices and for identifying new ways to solve problems of educational practice.
The CASTL Program’s mission statement may assist the reader in understanding how useful its body of knowledge may be to studio educators in the discipline of landscape architecture.

“It fosters significant, long-lasting learning for all students; enhances the practice and profession of teaching, and; brings to faculty members' work as teachers the recognition and reward afforded to other forms of scholarly work” (CASTL, 2011, p. 1).

2.4.8 Mick Healey – scholarship of teaching

Mick Healey has written that multiple objectives for conducting pedagogical research demand a broader definition of scholarship of teaching. Healey is a researcher and consultant at Cheltenham and Gloucester College of Higher Education. He has “written extensively on the scholarship of teaching” (Healey, 2000, p. 169). Healey has stated that, “if the scholarship of teaching is to match that of research there needs to be comparability of rigour, standards and esteem” (Healey, 2000, p. 5). In the autumn of 2000, Healey conducted a survey of delegates at an ILT symposium (Information and Learning Technologies) on ‘The Scholarship of Teaching’ and participants in a SEDA Workshop (Staff and Educational Development Association) on ‘Embedding the Scholarship of Teaching into the Practices of Developers and Higher Education’. Healey had 77 participants complete all or parts of the survey. Prior to his survey, Healey had found little consensus concerning the definition of scholarship of teaching. Following his survey, he concluded “…there is a consensus by nine out of ten people interested in the subject that the scholarship of teaching involves studying, reflecting on, and communicating about teaching and learning, especially within the context of one's discipline” (Healey, 2000, p. 189). Toward this end, Healey credited the work of “Ernest Boyer and his colleagues at the Carnegie Foundation for the Advancement of Teaching (Boyer, 1990; The Boyer Commission on Educating Undergraduates in the Research University 1998; Glassick et al., 1997; Hutchings, 2000; Hutchings and Schulman, 1999; Schulman, 1993; 1999)” (Healey, 2000, p. 2) for assuring that faculty in practice-based disciplines were provided rigorous standards for conducting and disseminating pedagogical research.

“‘The very concept of a scholarship of pedagogy is still very unfamiliar to many university teachers” (Baume, 1996, p. 4). Developing the scholarship of teaching is an important way in which individuals can act as professional teachers, and institutions and disciplines can raise the status of teaching” (Healey, 2001, p. 1).

Appropriately, this study used similar standards of rigor to examine scholarly pedagogic articles authored by studio educators on topics concerning strategies for identifying new ways
to solve problems of educational practice, while at the same time teaching students to solve complex, open-ended or ill-defined studio-based problems. It appeared there were multiple objectives for conducting pedagogical research that demanded a broader definition of scholarship of teaching.

2.4.9 Cross and Steadman’s taxonomy of multiple scholarships of teaching

K. Patricia Cross and Mimi Harris Steadman have pointed out the advantages of using all four of Boyer’s models of scholarship to “transmit, transform and extend knowledge generated in the classroom” (Cross & Steadman, 1996, p. 28). By accessing general and discipline-specific pedagogical research methods, they argued that teaching faculty have moved from trial-and-error teaching to systematic research-based strategies. They showed, through their classroom research, the value of –

“discovery research into the nature of learning and teaching;
integration of material from several disciplines to understand what is going on in the classroom (or studio);
application of what is known about how students learn to the learning-teaching process; and

“...teaching, “not only transmitting knowledge, but transforming and extending it as well!”” (Boyer, 1990, p. 24).

Landscape architecture needs to be sure that studio educators have the necessary training to successfully teach. Cross and Steadman’s taxonomy of multiple scholarships of teaching has proven to be a relevant research-based strategy recognized by teaching faculty in several disciplines. This finding was based on Healey’s survey of participants at the ILT symposium and SEDA Workshop in the autumn of 2000 (Healey, 2001, p. 11).

While multiple scholarships of teaching have been implemented in other disciplines, they are not commonly mentioned in landscape architecture’s pedagogical literature. But when used, multiple scholarships of teaching have provided teaching faculty with alternate routes for conducting successful discipline-based pedagogical research. For landscape studio educators this has involved the integration of ideas and skills through interdisciplinary problem-solving activities. It has encouraged the application of ideas and skills through community and service-learning experiences where students engage community partners using skills they have just learned. It has also advanced the practice of teaching by transforming and extending the means by which teachers train students to solve problems beyond the studio.
environment. Healey has reminded us that “the scholarship of teaching is an evolving idea, but... developing the scholarship of teaching with its emphasis on reflection, research, evaluation and communication should help to raise the overall standard of teaching and ways of facilitating learning” (Healey, 2001, p. 10).

2.4.10 Kathleen McKinney – good teaching
Kathleen McKinney has reviewed characteristics of good teaching. “Good teaching is that which promotes student learning and other desired student outcomes. Good teaching will support department, college, and institutional missions and objectives. Decades of SoTL (Scholarship of Teaching and Learning) and other educational research provide us with a great deal of information on the practices that help promote learning e.g., (Astin, 1993; Chickering & Gamson, 1987; Pascarella & Terenzini, 1991)” (McKinney, 2003, p. 1). Healey concurred.

“Good teaching, like good research, is multi-dimensional, difficult and contextual. Developing the scholarship of teaching involves many challenges and much work remains to be done to identify the most appropriate ways in which this might be done. An excellent starting place would be to encourage colleagues to apply the same kind of thought processes to their teaching as they do to their research. If more university teachers followed this dictum more scholarly teaching should result and, more significantly, the quality of learning of our students should be enhanced (Healey, 2000b)” (Healey, 2000, p. 11).

McKinney has suggested good teaching may well occur in the lecture hall or in the studio; however, it is well documented in educational literature that lectures provide inadequate opportunities to engage students in the process of hands-on learning. Graham Gibbs has concurred “the best learning is done in small classes involving personal interaction with teachers” (Gibbs, 2013, p. 1). If this situation is true, then the design studio may be considered an ideal teaching and learning environment. For the very reason, according to Gibbs, that the studio provides long contact hours, low teacher-student ratios, and one-on-one desk critiques. Studios are distinguished as much by their open-ended approach to teaching and learning as to their innovative approaches to problem-solving. Knowledge held by educators teaching small classes may be considered a valuable commodity to be shared with a broader inquiring audience through pedagogical research known as SWOTL.

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3 This study examined the extent to which multiple scholarships of teaching were evident in academic articles (data set 1) deemed to have characteristics of scholarly work on teaching and learning.
2.4.11 Conclusion to the first section of literature review

What Boyer accomplished during his tenure at The Carnegie Foundation was to bring a broader understanding of the term scholarship to the discussion. Today we understand that scholarship is more than traditional research. It is, as Boyer described it, the scholarships of discovery, integration, application and teaching. Scholarship of teaching is further supported by the concept of multiple scholarships of teaching, which focus and extend pedagogical research. As a result of Boyer’s work, scholarship is now considered something “that brings legitimacy to the full scope of academic work” (Boyer, 1990, p. 16).

2.5 Disseminating new knowledge beyond the studio

2.5.1 Maryellen Weimer – assessing the academic rigor of pedagogical literature

Scholarly work on teaching and learning literature has played an important role in stimulating academic rigor in practice-based disciplines. According to Maryellen Weimer, “interest in the scholarship of teaching, one of four kinds of scholarship identified in Boyer’s report, has created a window of opportunity for pedagogical scholarship” (Weimer, 2006, p. 3). Her interest goes beyond traditional literary reporting of pedagogical research. Weimer wrote “good discipline-based scholarship is seen by a very few when it is relevant to very many. This means that a good deal of wheel reinvention occurs because many instructional issues transcend disciplines, since most of this literature is isolated and idiosyncratic’” (Weimer, 2008, p. 1). She continued. “Lessons learned in one field are relearned in another and that collective information never becomes a coherent knowledge base that might inform practice wherever and whenever groups are used in college classrooms” (Weimer, 2008, p. 2). When consigned within a specific discipline, unique research designs and forms of inquiry are lost or unavailable to other disciplines.

Weimer has suggested, findings that are specific to one discipline cannot be extrapolated to other fields, but research designs certainly can be. Weimer has reminded us that some of these instructional studies are worth replicating. She believes that we must work on the ingredients and components of instruction which have been shown time and again to transcend disciplines. Weimer has advocated for “the application of relevant standards… but recognizes that unfortunately… many of those have yet to be articulated” (Weimer, 2008, p. 3). While Weimer has felt strongly that SWOTL should be shared across disciplines, she has also recognized the value in supporting robust pedagogical scholarship within the disciplines.
“The other argument used to justify positioning serious pedagogical scholarship within the disciplines is that this is the place where work is counted. Promotion and tenure decisions start at the departmental level and it is the assessments of those within a discipline that matter most. This is true, but the argument rests on the assumption that disciplinary knowledge and content background are somehow relevant to making judgments about scholarly work on teaching and learning. In fact, three problems regularly emerge when discipline-based colleagues judge scholarship on teaching and learning. First, there is no guarantee that colleagues in the discipline are pedagogically savvy—that their views of teaching are anything but eclectic, idiosyncratic and uninformed. Whatever those views, they become the lens through which the work of others is assessed. Second, most discipline-based faculty are not well versed in the conduct of educational research. They are quick to criticize or cast aside methods that do not conform to the protocols and conventions of the discipline. Time and again in my experience I’ve seen faculty impose disciplinary standards on work that has nothing in common with what or how the discipline studies phenomena. And finally, some forms of pedagogical scholarship are unique—they integrate experiential and empirical knowledge, they review findings and extrapolate practical implications, they look reflectively and critically at practice drawing viable lessons from experience, for starters. Unfamiliar with this kind of work, discipline-based faculty have no criteria with which to judge it. So, I don’t think discipline-based colleagues automatically make better assessments of pedagogical scholarship” (Weimer, 2008, p. 3).

Weimer has addressed these concerns in her 2006 book, *Enhancing Scholarly Work on Teaching and Learning*. Weimer took a comprehensive look at pedagogical literature as it has been handled within and among diverse practice-based disciplines. She posited that a number of key questions regarding the development and academic rigor of pedagogical literature can be explored in individual disciplines by looking back at their published history. Weimer claimed it was possible to categorize the published pedagogic literature of any practice-based discipline by its scholarly character and rigor. To do this, Weimer developed a concise classification scheme for analyzing the academic rigor of discipline-based literature. Thereby, providing any discipline with a starting point for better understanding the status of its’ practice-based knowledge, how that knowledge is being transmitted to the next generation of practitioners, and whether new knowledge is being introduced (Weimer, 2006). Weimer’s assertion infers that the scholarly rigor of landscape studio educators’ pedagogical research published in academic articles can now be assessed. To test her assertion, this study applied Weimer’s classification scheme to a census of discipline-based academic articles in *Landscape Journal, Landscape Research, and Landscape Review*. 
2.5.2 Selection of landscape architecture journals

Journals selected for review were based on the following discipline-based criteria. They supported pedagogical research in their mission statement. They were peer-reviewed. They were available in paper format. They had a broad international readership and were published in the English language. Three landscape architecture journals met these criteria and were selected for review. There were Landscape Journal, Landscape Review and Landscape Research: Journal of the Landscape Research Group. All three journals’ mission statements mentioned pedagogy as a solicited topic for publication and complied with the other criteria. The following three paragraphs describe the journals in more detail.

*Landscape Journal* has been the official journal of the Council of Educators in Landscape Architecture (CELA) for more than 25 years. Published by the University of Wisconsin Press, *Landscape Journal* was deemed an appropriate data source for this study, for the reason that it “offers in-depth exploration of ideas and challenges that are central to contemporary design, planning, and teaching” (CELA, 2014, p. 1). The journal provides peer-review for all authors interested in submitting research for publication. Peer reviewers are primarily academicians from universities in English speaking countries. Although some professionals and academicians also participate.

*Landscape Review* is a peer-reviewed international journal of landscape architecture based at the School of Landscape Architecture, Lincoln University, Christchurch, New Zealand. The journal is committed to the development of a culture of research and scholarship in landscape architecture. It has been published since 1995 (Editors, 2014). *Landscape Review* actively seeks to develop the landscape architecture research network in the Southern Hemisphere through themed calls-for-papers. Pedagogic was a themed paper in 2004.

*Landscape Research: Journal of the Landscape Research Group,* “was established to advance education and research, encourage interest and exchange information for public benefit in the field of landscape and any related field” (Jorgensen, 2015, p. 1). The quarterly journal, based in Wimbledon, London, publishes original research papers with reflective critiques of landscape practice. All research articles undergo rigorous peer review, based on initial editor screening and anonymized refereeing by two referees.

Since this study was initiated in 2005, affiliated journals and on-line journals have become more readily accessible. Paper journals may now be accessed on-line. Word searchers are
easy to conduct. Still, the three journals examined in this study remain strong defenders of robust scholarship.

2.5.3 Weimer’s classification scheme for evaluating SWOTL literature

Weimer built on Boyer’s research by providing a classification scheme for evaluating the scholarly rigor of work conducted by “postsecondary faculty in disciplines other than education” (Weimer, 2006, p. 21). She argued it was important to systematically assess the content of discipline-based journals that discussed instructional methods or pedagogical issues. Most disciplines hold these forms of research to lesser standards of rigor. She has shown that “much can be learned by looking at a journal’s content systematically” (Weimer, 2006, p. 30). The problem for most design disciplines, landscape architecture included, is the fact that “no systematic content analysis of the literature as a whole has been undertaken, and few such analysis have been done for individual periodicals… [but] without good content analysis work, we cannot say if any instructional method is written about more often than any other evaluative method” (Weimer, 2006, pp. 29-30).

2.5.4 Wisdom of Practice Scholarship

Weimer’s method of analysis sorted pedagogical scholarship in two main categories: Wisdom of Practice and Research Scholarship. The first category, Wisdom of Practice Scholarship, was based on “work that rests on experience” (Weimer, 2006, p. 91). Weimer identified four common approaches authors have used to report their Wisdom of Practice research.

1). “Personal accounts of change allow faculty to report experiences associated with instructional change” (Weimer, 2006, p. 55). These are articles where faculty report experiences associated with a change in instructional practice or gives an account of changes made by the author and colleagues to a specific course or collection of courses. Usually the story relates how it was done in the old days, why we decided to make changes, how we implemented those changes, and how the results lead to improvements.

2). “Recommended practices reports let faculty offer advice or make suggestions about some or several aspects of practice or content” (Weimer, 2006, p. 55). These reports aim to tell – mostly individual faculty but sometimes institutions or disciplines – what they should do about particular

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4 This study may be the first to use Weimer’s classification scheme to assess teaching and learning literature in the discipline of landscape architecture, or more specifically assess SWOTL articles reporting pedagogical problem-solving activities taking place in the landscape studio.
aspects of instruction. The advice is typically based on a combination of personal experience, collective experience, and empirical research.

3). “Recommended content reports are exactly the same as recommended-practice reports, except the suggestions and advice pertain to disciplinary content” (Weimer, 2006, p. 55). These reports are advice-giving papers that focus on the content of a course, not the teaching methods. The suggestions offered in these reports include advice on what content should be covered in particular courses, sequences of courses, or degree programs.

4). “Personal narratives allow faculty to share individual opinions, viewpoints, ideas, concerns, or positions related to teaching” (Weimer, 2006, p. 55). While papers in this category may be based in part on studio experience, the focus is on what the author thinks and feels. This work often has a strong emotional element and authors often advocate for or against a particular policy or practice.

Wisdom of Practice scholarship has been found to span the greatest range of scholarly writing. It also represented the most eclectic subcategories of SWOTL and quite possibly contained the least scholarly of all the types of reporting, that of personal narratives. Weimer has referred to personal narratives as “who cares knowledge?” (Weimer, 2006, p. 83). While on the other hand, recommended practices reports may have the most utility of any type of writing. These “reports represented advice giving that informs not only the scholarship of discovery, but also integration and application” (Weimer, 2006, p. 57). Unlike empirical research, Wisdom of Practice Scholarship “need not always discover something new… It may simply open the door and ask, did we learn anything?” (Weimer, 2006, p. 83).

2.5.5 Research Scholarship

The second main category of SWOTL may be described as Research Scholarship. It represents work “that discovers, that interprets, or that explores” (Weimer, 2006, p. 92). Three common types of research scholarship have been identified by Weimer.

1). “Qualitative studies use a variety of borrowed approaches, such as introspective analysis, participant observation, and ethnography. Qualitative studies has a multi-method focus involving an interpretive, naturalistic approach to its subject matter. This means that qualitative researchers study things in their natural settings, attempting to make sense of or interpret phenomena in terms of the meanings people bring to them.

2). Quantitative investigations were modeled on traditional social science. They use experimental designs as well as comparative and correlational ones. They involve treatment and control groups, and a manipulation of variables across them. To this extent, the definition of quantitative investigations was taken directly from formal research methods in the social sciences.
3). Descriptive research employs survey and interview techniques to establish what, “is”. This is usually done through surveys of students, faculty, or both” (Weimer, 2006, p. 92).

Quantitative research questions inquire about the relationships among variables that the investigator seeks to know. They are used frequently in social science research and especially in survey studies. An example of a script for a quantitative research question reads like this: Does (name the theory) explain the relationship between (independent variable) and (dependent variable), controlling for the effects of (control variable)? The most rigorous form of quantitative research follows from a test of a theory and the specification of research questions or hypotheses that are included in the theory. This type of research scholarship has been promoted by the Landscape Architecture Foundation, but has not been commonly used as a pedagogical research method (ASLA, 2011).

2.5.6 Promising Possibilities Scholarship
Programs promoting scholarship on teaching and learning are now worldwide with increasing “calls for new forms of scholarship and new venues for dissemination” (Weimer, 2006, p. 4) So, Weimer introduced a third category of scholarship. She called it “promising possibilities” (Weimer, 2006, p. vii). Scholarly writings in this category have taken into account unique methods, hybrids, unusual formats, and other approaches. While rare in many disciplines, these forms of pedagogical scholarship may provide design educators with useful ways to share scholarly knowledge on teaching and learning in the studio. One reason, according to Weimer, is promising possibilities literature does “defy well-established protocols that constrain creativity” (Weimer, 2006, p. 126). At the same time, they hold “potential as viable literature and credible scholarship” (Weimer, 2006, p. 123). Three common types of promising possibilities literature have been identified by Weimer.

1). “Hybrids are articles that creatively combine two or more of the major approaches found in the Wisdom of Practice category or in Research Scholarship” (Weimer, 2006, p. 125).

2). “Innovative Approaches are articles in which the method of analysis is not one of the seven major approaches found in the Wisdom of Practice category or in Research Scholarship, but is either something different or an especially creative use of one of the approaches. Innovative Approaches may also be books, newsletters, or on-line course work” (Weimer, 2006, p. 131).

3). Unique Formats are materials presented or structured in some unusual way; often they provide a sense of “spontaneity or a personal feel” (Weimer, 2006, p. 128).
Weimer’s Promising Possibilities category is a look into the future of Scholarship of Teaching and Learning studies. Although not widespread, Weimer has observed increasing use of this category by authors in practice-based disciplines (Weimer, 2008). Others have made similar observations. When reviewing design journals published between 1999 and 2010, Blossom, et al., found credible use of “hybrids (combining any of the previously reviewed types), innovative approaches (using a method that is creative), and unique formats (reporting the work in an uncommon form)” (Blossom, et al., 2011, p. 5). Promising possibilities scholarship appears to have the capacity to provide design faculty with useful ways to share scholarly knowledge. While some assessment of promising possibilities literature has taken place in the disciplines of interior design and architecture, there is little evidence that analysis has been conducted for the discipline of landscape architecture using Weimer’s classification scheme. More inquiring work will be needed to inform the discipline vis-à-vis the collective value of pedagogical scholarship in the design disciplines, and landscape architecture in particular.

2.5.7 Nigel Cross and fellow design scholars

Certain scholars in the design disciplines have recognized the importance of generating and disseminating pedagogical problem-solving knowledge to a wider audience (Cross, 1999) (Cross, 2010). These scholars have been gathering since 1990 to discuss ways in which they may engage their students in unique problem-solving activities known as design thinking. Nigel Cross, a pioneering member of the group from the Open University, London, described their collective thinking this way; “there are forms of knowledge particular to the awareness and ability of a designer, just as the other intellectual cultures concentrate on forms of knowledge particular to their discipline” (Cross, 1999, p. 5). “We do not have to turn design into an imitation of science, nor do we have to treat design as a mysterious, ineffable art. We recognize that design has its own distinct intellectual culture. We must assure that the design culture is promoted through decisive acts of teaching” (Cross, 1999, p. 6).

Cross and colleagues have recognized that an impediment to successful teaching comes when design educators fail to communicate new knowledge beyond the studio environment. For this reason, they have made a case for incorporating worthwhile pedagogical research standards into design studio activities. In so doing, they have promoted the design culture through ‘decisive acts of teaching’. As editor-in-chief of the peer-reviewed journal Design
Studies, Cross has promoted pedagogical research standards sanctioned by The Carnegie Academy for the Scholarship of Teaching and Learning Program (Cross, 2010).

2.5.8 Scott Jaschik – questioning pedagogical research standards
While Nigel Cross and his colleagues reported positive progress in achieving pedagogical research standards, other scholars have suggested the process is too slow-moving. In an online article critiquing the Carnegie Foundation report, Faculty Priorities Reconsidered: Rewarding Multiple Forms of Scholarship, Scott Jaschik, editor of Inside Higher Education, wrote “there is little evidence of change to be seen in the dominant research behavior within higher education; and this, two decades following the publication of Scholarship Reconsidered” (Jaschik, 2005, p. 1). These were two different opinions of scholarship within higher education.

2.5.9 Conclusion to the second section of literature review
Jaschik questioned whether there has been any real change in the traditional research culture in higher education. Yet, the impact of Boyer’s model of scholarship was recognizable when viewed through the lens of scholarship of teaching and learning provided by Weimer and through the pedagogy of design conducted by Nigel Cross and his colleagues. Cross has acknowledged “that design has its own distinct intellectual culture… which we must assure… is promoted through decisive acts of teaching” (Cross, 1999, p. 6). Cross believed that design educators must not fail to communicate new knowledge beyond the studio. Weimer has supported this line of thinking; arguing that, it is important for teaching faculty to conduct pedagogical research for the following reasons.

“Educators can explore questions that interest them. Educators develop instructional awareness and think more deeply about teaching and learning. Pedagogical research motivates and keeps teaching fresh over the long haul. SWOTL literature fosters new ways of learning and improves conversations with colleagues and others” (Weimer, 2006, pp. 169-174).

Best of all, scholarly work on teaching and learning literature “allows educators to find something that has not already been done” (Weimer, 2006, p. 177). This may take a little longer, as Jaschik has pointed out, but Nigel Cross believes it will be well worth the wait.
2.6 Evolving studio-based professional education

2.6.1 Lloyd E. Blauch – evolution of professional education

An historical review of the evolution of professional education, from the apprenticeship system to the academic design studio, may be useful in understanding where studio pedagogy resides today. Lloyd E. Blauch was Senior Specialist in Higher Education for the United States Office of Education from the 1930’s to the 1960’s. He published extensively on education, accreditation, and assessment in higher education. In a report to the Society for the Advancement of Education titled, A Century of the Professional School, Blauch described “three stages in the evolution of professional education” (Blauch, 1962, p. 48). The first stage of professional education conducted prior to World War II trained students based entirely on apprenticeships within professional practice. The second stage of student training began, in the United States, following World War II with the initiation of the Serviceman’s Readjustment Act of 1944, better known as the G. I. Bill (Humes, 2006). This second stage was centered within an academic design studio teaching and learning environment where it was separated from, but often mimicked, professional practice. It was about this time that profession-based disciplines began to search for ways to integrate theory-based education with various apprenticeship experiences. Apprenticeship experiences in the United Kingdom were different from those in the United States.

British “live projects” at some institutions of higher education in the United Kingdom have kept the past two generations of students from ever experiencing Blauch’s second stage of professional education. British “live projects” have involved students in architecture and allied disciplines in the total design and construction of multi-family dwellings. These hands-on projects have been described as design projects “with a real client, with a real problem ... done in real time, with a defined end result” (Chiles & Holder, 2008). According to James Brown, these projects “seek to remove students from the autonomous environment of the studio” (Brown, 2009). As such, “they can broadly be divided into those projects that give students two distinct forms of ‘hands-on’ experience: first, of collaboration with others beyond the studio; and second, of actual building processes” (Brown, 2009, p. 2).

This researcher spoke with Brown. Our conversation focused on the importance of having well-planned pedagogically valuable regimens where students participate in service-learning projects, collaborate with others, and share discipline-based knowledge as part of their core
professional training. When based on theory, this type of professional training aligns with Blauch’s third stage of professional education.

Publication of Boyer’s 1990 Model of Scholarship ushered in Blauch’s third stage of professional education. Blauch had anticipated a transition toward theory-based education distinct from professional practice. Prior to 1990, faculty in profession-based disciplines had begun to search for new ways to integrate theory-based education with apprenticeship experiences. Faculty in engineering and nursing led the way to integrate theory-based education with apprenticeship experiences.

In the design disciplines, studio educators began to search for new ways to integrate problem-solving theory with the problem-solving process in the design studio. In the discipline of landscape architecture, Blauch’s third stage of professional education was strengthened through the (philosophical models) theories and principles spoken of by landscape studio educators in the literature. Collectively, studio educators’ published work helped to establish a relationship between problem-solving theories and discovery, integration and, or, application of these activities in the design studio.

The third stage of professional education described by Blauch, came as studio educators communicated pedagogical advancements clearly through conference papers, peer-reviewed articles and other scholarly venues. As studio educators grappled with questions of theory relevant to pedagogical problem-solving in the twenty-first century, they placed emphasis on service-learning, case studies, and practice-based projects to generate pedagogical research, or what Meyers and Jones have referred to as active learning techniques. Review of the literature has suggested this focus was due, in part, to an expanded definition of scholarship allowing work in the studio to be recognized as scholarship in peer-reviewed journals.

2.6.2 Donald A. Schön – the design process
According to Chris Argyris and Donald A. Schön, reliance on theory has been amongst the most telling distinctions between a discipline and a profession (Argyris & Schön, 1974). The transition to Blauch’s third stage of professional education was supported by Schön, who believed that “theory building marks scholarship and scholarship develops theories of action by which the profession is practiced” (Dinham & Stritter, 1986, p. 952). Schön was the first educational researcher to describe the design process as it was experienced in the design studio. He found novice students learned to rely on implicit knowledge embedded in the normative curriculum of professional education. Only later did students develop their own
repository of explicit problems-solving knowledge. This has proved to be a polemic topic with design educators who convey problem-solving knowledge to their students in a variety of ways.

2.6.3 Bryan Lawson – ‘creative leaps’

Bryan Lawson suggested that students developed design expertise by means of focused design cognition, in addition to Dewey’s ‘creative leaps’ (Lawson, 2004). Lawson also suggested that architecture students approached the design process “using a number of parallel lines of thought in a simultaneous, rather than sequential, manner at both the detailed and global levels” (Lawson, 2004, p. 443). Other design educators have reported that students learn discipline specific knowledge by solving traditional problems. This is the method described by Schön in 1983, where the student uses “an artificial situation presented by the studio tutor” (Schön, 1983, p. 150) to test his or her problem-solving knowledge. In this way, novice students gain confidence applying problem-solving knowledge to simple problems.

On the way to becoming competent professionals, students have been required to learn a variety of problem-solving tools, techniques and theories that cross disciplinary boundaries. Interdisciplinary studios have offered students unique learning experiences. Studio educators have recognized that students learn by sharing their own discipline-based approaches to solve complex problems. Incorporating interdisciplinary learning experiences into the studio curriculum requires students to understand their own discipline-based design process and discipline-based approaches to solve complex problems, as well as those of allied design disciplines.

Omer Akin has said that it is necessary for novice students to gain confidence applying problem-solving knowledge to new problems. He has cited successful use of precedents or “examples that support students’ own designs” (Akin, 2002, p. 408). In this way, he has shown how students experience less frustration while they build their problem-solving knowledge and skill.

In more recent years, students have been introduced to each stage of the design process – building theory, technical proficiency and problem-solving skills while using the design process described by Schön (Schön, 1983). Although the design process provides the means

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5 The researcher of this study was interested in finding out if first and final year students experienced different levels of frustration while they built problem-solving knowledge and skill.
by which students express their design ideas, it does not determine specific approaches used by students to solve design problems. Those decisions are left to the individual, given that the approach to solving problems is taught and practiced in a variety of ways, reflecting the discipline, academic institution and individual instructor (Schön, 1986).

2.6.4 David Kersey – ‘bodies of knowledge’
David Kersey demonstrated the value of the studio functioning as a primary repository for diverse problem-solving knowledge that crosses disciplinary boundaries. In his 2008 Master’s thesis, Kersey investigated where intersections exist between a spatial temporal problem-solving discipline, landscape architecture, and the emerging field of GIScience. He did this based on their respective ‘Bodies of Knowledge’. Kersey’s work demonstrated hundreds of similarities in the body of knowledge expected from graduates of Landscape Architecture Accreditation Board (LAAB) accredited first degree programs and the spatial temporal problem-solving knowledge needed to perform Geographic Information Science (Kersey, 2008). He found that the primary body of problem-solving knowledge included, “analytical methods, conceptual foundations, cartography and visualization, design aspects, data modeling, and data manipulation; not to mention, other things like basic geography, CAD and organizational skills” (Kersey, 2008, p. 45). These skills were used to understand, design and, or, implement relationships between social and natural systems within a spatial temporal context as defined by both disciplines. Kersey’s study provided valuable information on approaches educators may take to prepare their students for practice in interdisciplinary situations, since opportunities to practice in interdisciplinary situations are likely to grow. The American Society of Landscape Architects’ web site reported in 2011 “30% of landscape architects practice in interdisciplinary positions” (ASLA, 2011, p. 1).

2.6.5 Researcher’s comments on pedagogical problem-solving knowledge
It was rewarding to find that another discipline was sharing primary problem-solving knowledge utilized in training landscape architects to train their own students. However, a comprehensive inventory of these things has yet to be completed in the landscape studio. At least, the literature review for this study found no comprehensive body of pedagogical problem-solving knowledge having been conducted for the landscape studio. So, it appeared to the researcher that a baseline of pedagogical problem-solving knowledge needed to be established. It was reasoned, once completed, landscape architecture’s studio educators would be in a better position to share their discipline-based pedagogical problem-solving
knowledge and its proper application with interested educators in allied fields. For this reason, this study gathered problem-solving knowledge mentioned in academic articles as successful ways to transmit knowledge. Later, this study queried students in landscape studios to verify their preferred ways of solving studio-based problems.

2.6.6 Teamwork

The importance of teamwork has been rising as interdisciplinary-style work expands across a wide range of disciplines. Many discussions regarding studio-based learning have assumed the value of simulating professional problems for pedagogical purposes. Likewise, they have assumed that studio-based education takes place in a collective setting, requiring each student to gain understanding of the design process in a collaborative learning environment (Cooper, et al., 2008). This idea presumed the value of teamwork and collaboration during the cooperative learning process (Shih, 2006).

Another area where teamwork may be valuable is in the interdisciplinary studio. According to John R. Hays, as society has become more complicated and environmental issues more pressing, design studio briefs have become more complex, open-ended and, or, ill-defined (Hayes, 1978). Some studio educators have elected interdisciplinary or multidisciplinary approaches (Stokols, 2011) when engaging their students in identifying, exploring and resolving complex problems not yet thought of (Braungart & McDonough, 2002). Complex projects create interest beyond the studio walls.

The desire for environmental holism has been implicit in the current discourse in sustainable “green” design. Michael Braungart and William McDonough in their 2002 book, *Cradle to Cradle: Remaking the Way We Make Things*, have challenged designers in the twenty-first century to begin to imagine “things that are only beginning to be imagined, or have not yet been conceived” (Braungart & McDonough, 2002, p. 180). They have been particularly concerned with “human and ecological health, cultural and natural richness, and even enjoyment and delight” (Braungart & McDonough, 2002, p. 42). Many studio activities are now based on understanding, designing and, or, implementing relationships between social and natural systems within a spatial temporal context as defined in landscape architecture’s discipline-based literature (Lynch & Hack, 1998). These activities allow students to reflect on

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6 This was an idea that was revisited during this study to see whether teamwork was considered an effective way to train students to solve problems.
real issues, engage with communities through service-learning experiences that produce built design projects and interact with students from other disciplines in interdisciplinary venues. Where once the design process was “largely implicit” (Schön, 1986, p. 52), design educators now convey problem-solving knowledge to their students in a variety of explicit ways. These explicit ways of learning have value when shared in the interdisciplinary studio, because they simulate the collaborative effort expended in professional practice to solve real problems. In the researcher’s estimation it gets complicated, because these ways of conveying problem-solving knowledge to students were not clearly cataloged or prioritized. Faculty, who have little or no professional practice experience, may not be as familiar as academic practitioners with some of the complex or intuitive problem-solving tools, techniques or theories used to replicate for students the professional studio experience. This may limit the effectiveness of studio-based learning.

2.6.7 Donald A. Schön – studio-based learning

Scholars have long acknowledged that training students for professional practice starts in the studio, because the studio is where students learn discipline-specific theories and principles by solving traditional studio-based problems. Pedagogical research has shown that novice students gain confidence applying problem-solving knowledge to simple problems utilizing set protocol. Expert students learn to address complex problems (Hayes, 1978) (Dorst & Cross, 2001) shifting their focus of problem-solving to problem setting and finally to problem discovery (Schön, 1983).

The system of studio-based learning was first described by philosopher Donald A. Schön in his 1983 book, The Reflective Practitioner: How professionals think in action (Schön, 1983). This book was followed four years later by Educating the Reflective Practitioner: Towards a New Design for Teaching in the Professions (Schön, 1987). The series was completed in 1991 with, The Reflective Turn: Case Studies In and On Educational Practice (Schön, 1991). Prior to writing these books, Schön had been advancing theories on professional learning, organizational learning and self-reflective practice with Chris Argyris, a colleague at MIT.

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7 Further inquiry will be needed to determine whether students have sufficient problem-solving knowledge to address complex problems not yet thought of.

8 One aspect of this study was to document preferred ways novice and expert students solved studio-based problems.
Studio-based learning is a form of knowledge acquisition that confounds traditional scholars when describing the design studio and the activities that take place within its unique environment. This may be a reason for why it is so difficult to codify design studio pedagogy, especially problem-solving activities or for that matter, to encourage studio educators to embark on scientific inquiry to comply with academic research mandates. When strategizing ways to convey practical problem-solving knowledge to landscape architecture students, it might be helpful to step outside our primary discipline and take a critical look at activities taking place in other practice-based disciplines; especially in disciplines that rely on collaborative design studios.

2.6.8 Team-teaching
This literature review found studio educators from landscape architecture, interior design and architecture have studied team-teaching within the interdisciplinary design studio. Studio educators publishing on this topic included Kees Dorst and Nigel Cross (Dorst & Cross, 2001), Paul Selman, (Selman, 2003), Nazanin Khodadad (Khodadad, 2012), and Jon Daniel Davey, (Davey, 2008). Studio educators have organized interdisciplinary studios to encourage more interaction among students from allied and non-design disciplines. Studio-based evidence suggests acquisition of interdisciplinary knowledge allows students to become contributing members of their professional design communities. Toward this end the design studio has been shown to function as a primary repository of problem-solving knowledge for all disciplines.

2.6.9 Robert M. Hutchins – the ‘learning society’
In the 1970s, Schön had studied “the role of reflection (or lack of it) in learning processes in general, and conceptual and perceptual change in particular” (Smith, 2009, p. 1). Schön based his reasoning on Robert M. Hutchins’s description of the ‘learning society’. Hutchins defined two essential components of the ‘learning society’: “the increasing proportion of free time and the rapidity of change. The latter requires continuous education; the former makes it

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9 This study identified various interdisciplinary approaches to teaching problem-solving in the landscape studio. Additional research will be needed to test/apply new knowledge gained in this study to team-teaching approaches used in the design studio.
possible” (Hutchins, 1970, p. 130). Hutchens posited that “education was no more a segregated activity, conducted for certain hours, in certain places, at a certain time of life” (Hutchins, 1970, p. 133). The significance of learning in changing societies became the basis for Beyond the Stable State (Schön, 1973). In his book, Schön argued that ‘change’ was a fundamental feature of modern life; as such, it was necessary to develop social systems that could learn and adapt. The design studio was viewed as one such system. Schön carried this line of reasoning through much of his professional work. This concept of educating for change has remained foundational in studio pedagogy.

2.6.10 Donald A. Schön – ‘reflection-in-action’ and ‘reflection-on-action’

By the time Schön began writing the Reflective Practitioner series, he had reported on change; its influence on professional learning and on the processes and development of reflective practitioners. Specifically, he had written about “what a (small) number of different practitioners actually do; leading him to argue that practitioners’ work was ‘susceptible to a kind of rigor that is both like and unlike the rigor of scholarly work and controlled experimentation’ (Schön, 1983, p. ix)” (Smith, 2009, p. 1). Schön had observed professionals describing “how they ‘think on their feet’, and how they make use of a repertoire of images, metaphors and theories” (Smith, 2009, p. 1). This process he called ‘reflection-in-action’.

Schön observed a subsequent process of behavior that enabled a practitioner to spend time exploring why they acted as they did, what was happening in a group and so on. Through this reflection process, Schön observed that practitioners developed a set of questions and ideas about their activities and practice. These questions and ideas led to further exploration and discovery. This process he called ‘reflection-on-action’.

Schön’s analysis of reflection-in-action and reflection-on-action led him to analyze the process students go through to solve problems in the design studio. In his 1983 book, Schön observed a female architecture student “as she circuitously tested her problem-solving knowledge using an artificial situation presented by the studio tutor” (Schön, 1983, p. 150). Schön described the distinct structure informing the way the student approached the design process. He observed that the student’s work often took a form similar to that of practitioners’ reflecting in- and on- their design work. In his writings, he defined the design process as “the approach taken by student and tutor toward problem identification, concept/idea generation, and design resolution (Schön, 1983, p. 374).
Schön’s description of the architecture studio was interpreted by various educators and instituted into design studio programs throughout the United States and other countries. Usher and et al., summarized the significance of Schön’s work.

“The impact of Schön's work on reflective practice has been significant - with many training and education programmes for teachers and informal educators adopting his core notions both in organizing experiences and in the teaching content. Indeed, there is a very real sense in which his work on reflective practice has become ‘canonical’ – frequently appealed to by trainers in a variety of professional fields” (Usher, 1997, p. 143).

Scholars have agreed that something significant happened when Schön presented reflection in- and on- action together in the literature. Mark K. Smith has noted that Schön’s “work was quickly, and enthusiastically, taken up by a large number of people involved in the professional development of educators, and a number of other professional groupings” (Smith, 2009, p. 1). Bowden, basing his work on Boyer’s scholarship of teaching, wrote that “teaching is… a dynamic endeavor involving all the analogies, metaphors, and images that build bridges between the teacher’s understanding and the student’s learning (Boyer, 1990, p. 23)” (Bowden, 2007, p. 2). Academic practitioners, along with design studio educators, recognized value in Schön’s work on reflective practice, because they use this distinctive form of education in practice. Schön’s core notions regarding organizing educational experiences have provided students with hands-on learning experience, mimicking practice and simulating complex problems similar to those faced in professional practice10.

2.6.11 Donald A. Schön – ‘learning-by-doing’
Next, Schön suggested that the design studio offered the individual student a way of ‘learning-by-doing’. This pedagogical experience has been found to be uniquely suited to practice under conditions of “complexity, uncertainty and uniqueness” (Schön, 1986, p. 5). Whether in the studio or in the field, design studio educators have strived to simulate complex problems similar to those faced in discipline-based professional practice. It is this distinctive form of education that mimics practice and provides students with hands-on experience, better known as learning-by-doing. In most landscape architecture programs, it is in the design studio where students are introduced to each stage of the design process – building theory, technical proficiency, and problem-solving skills. Scores of students learned

10 This study identified hands-on learning experiences used to train students to solve complex studio-based problems that often mimic those faced in practice.
to rely on implicit knowledge embedded in the normative curriculum of professional education as they develop their own repository of explicit problem-solving knowledge. Kristina Hill has pointed out a unique feature in the studio curriculum; students not only “apply theories and principles of landscape architecture to their own projects, they are required to do so” (Hill, 2010). Landscape architecture studios, not unlike architecture studios, have been designed to be responsive to students’ educational needs by providing ‘learning-by-doing’ experiences. This tradition is reflective of similarities in studio-based pedagogy regardless of the specific discipline. This study identified both types of knowledge being acquired by students using the frequency of mention in the educator-authored literature and students’ reporting their working preferences.

2.6.12  Donald A. Schön – ‘think-in-action’

According to Leonard J. Waks, as practice-based disciplines entered institutions of higher education, it became apparent to Schön that the “university had become the epistemological center of practice and training ground for all practitioners” (Waks, 2001, p. 39). Many landscape architecture departments were just getting established 30 years ago. Schön was well-placed to make this observation, as he had spent years in higher education studying a form of gaining knowledge specific to professional practice. Schön had identified ways in which knowledge was learned in the thick of the professional activity. Schön described how he saw professionals ‘think-in-action’ (Schön, 1983). He described practitioners by saying, “even when they do stop to reflect on action, they think in the language of practice, not the language of science” (Waks, 2001, p. 40). Schön made the following observations.

“Practitioners (such as architects, engineers, and industrial designers) have their own ‘esoteric’ knowledge codes woven right into their practices. Practice is a knowledge affair. Practitioners apply tacit knowledge-in-action, and when their messy problems do not yield to it, they do not take ‘time out’ to reflect, and they do not disengage from the languages of practice in order to use any more general methods of scientific inquiry instead, they ‘reflect-in-action,’ and in the languages specific to their practices (Schön, 1992, p. 125).

Schön made his observations from an environment rich in academic principles, philosophy, education and architecture. He understood the changing nature of practice and recognized the pressure facing students as they prepared to practice in a complex and uncertain future.
2.6.13    Amos Rappaport – project complexity

Thirty years before Schön published his observations about practitioners’ tacit knowledge-in-action, the design community was meeting to identify methods and models to help generate more systematic and objective ways of approaching design projects. Conversations took place at *The 1962 Conference on Design Method*, held in London at the Imperial College. It was followed by *The 1965 Birmingham Symposium*, which stressed an ‘operational research’ approach. In 1967, *The Southsea Symposium on Design Methods in Architecture* was held in Southsea, Great Britain. Four hundred architects and designers representing over fifty countries came together to discuss a new phase of thinking in architectural design methods, that of systematic design. By the late 1960s, it was evident to many in the architectural community that project complexity and scale were resulting in designers “not doing as well as they might” (Broadbent & Ward, 1969, p. 140).

At *The Southsea Symposium*, Amos Rappoport rallied the design profession by encouraging a serious discussion about cultural phenomenon, the role of facts, and environmental considerations. He was concerned with specifics as well as generalities, with differences and similarities, and with the scale at which comparisons were made. Rappoport, while recognizing that “everyone uses a method when they work” (Broadbent & Ward, 1969, p. 136), questioned the need for varying from traditional design methods. He was concerned that the complexities of the architecture profession, once forced into a more systematic and objective ‘way of seeing’, would result in the methodology becoming an end in itself, and thereby lack a tangible relationship to the real world. Rappoport reminded the architectural community that “the creative generation of hypotheses never seems to be done in a systematic way… and he urged the profession not to be too anxious to give up their traditional or uniquely personal models which are a flexible and powerful skill available to all designers.” (Broadbent & Ward, 1969, p. 146).

By the 1980s, the architectural community, led by the firm Caudill Rowlett Scott¹¹, was developing graphic techniques to assist design teams “to analyze problems, generate solutions, and evaluate results” (Laseau, 1980, p. 180). The profession was beginning to recognize the importance of “knocking down the barriers built by professional jargon” (Laseau, 1980, p. 180). Paul Laseau described how “new ‘ways of seeing’ and ‘ways of

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¹¹ The researcher of this study would suggest Schön’s work paralleled Caudill Rowlett Scott’s work, which in the end, resulted in the loss of uniquely personal models of creativity and design.
knowing’ were rapidly becoming ways of communicating. Emphasis was being placed on cross-disciplinary communication as planners, systems engineers, and transportation specialists, to name a few, began to enter the discussion-making process” (Laseau, 1980, p. 179).

Well into the twenty-first century, the design profession continue to wrestle with issues involving problem-solving, decision-making across design disciplines, and communicating with the general public. Design professionals and studio educators were beginning to find ‘ways of seeing’ and ‘ways of knowing’ that were conducive to architectural research and to collaborative design work. But, the fact remained that graphic communication and architectural research were not standardized throughout the design community. The lack of standardization in graphic communication and architectural research provoked response from architectural educators demanding systematic ways of training the next generation of practitioners.

Linda Groat, Sherry B. Ahrentzen and David Wang – research strategies
Linda Groat, Sherry B. Ahrentzen and David Wang’s research examined how design educators have conducted their research. Historically, pedagogical research has been positioned within scholarship on teaching and learning and within each discipline’s own pedagogical literature. Granted, this dual position has been changing. “Recent interest in scholarly work on teaching and learning has been accompanied by a move to more firmly wed pedagogical scholarship to the disciplines (Healey, 2000)” (Weimer, 2008, p. 1). Groat and Ahrentzen were some of the first design scholars to begin using Boyer’s criteria to study the design studio as an educational learning environment. In their 1997 article, Voices for Change in Architectural Education Seven Facets of Transformation from the Perspectives of Faculty Women, they extended Boyer’s challenge by asking the question, are schools of architecture truly producing problem solvers? (Bass, 1998, p. 271). A part of Groat and Ahrentzen’s findings included identifying research methods that were used in the architecture studio’s educational learning environment. They found that successful research methods maintained strong connections between social science strategies or ‘ways of knowing’ and architectural strategies. Some of these methods have been used by studio-educators in landscape architecture studios to conduct pedagogical research.

In the early 2000s, Groat and Wang described several architectural strategies, which had not been defined in terms of exact methodological typology”. Groat and Wang’s goal was to
provide a workable framework for enhancing designer’s creative endeavors. These architectural strategies or models for conducting research were considered especially useful during collaborative design projects or interdisciplinary research projects. In defining these architectural strategies, Groat and Wang wished not to restrain designers’ creative ideas or the materials being studied. Rather, these methodologies were intended to provide a framework, which would enhance creative endeavors. Their challenge to professional architects and educators was to conduct more rigorous research. Groat and Wang published their findings. Their initial list of architectural research methods included experimental, quasi-experimental, simulation, correlation, statistics, protocol analysis, content analysis, focus groups, ethnography, participatory observation, questionnaires, interviews, observation, interpretive-historical research, and narrative research methods (Groat & Wang, 2001). These methods were found to have pedagogical value; case studies\textsuperscript{12} appeared to be particularly well positioned within scholarship on teaching and learning and many studio-based disciplines’ own pedagogical literature.

2.6.15 Rolf Johansson – architectural research strategies

Rolf Johansson presented a key note speech titled, \textit{Case Study Methodology} at an International Conference\textsuperscript{iii}. Johansson described the value of case study methodology as “triangulation, the combination on different levels of techniques, methods, strategies, or theories” (Johansson, 2003, p. 11). He cited Groat and Ahrentzen’s article (Groat & Ahrentzen, 1997) and generated a diagram based on subsequent work Groat conducted with David Wang (Groat & Wang, 2001). The diagram he presented described the relationship between seven common architectural research methods, inserting Case Study as the meta-method that comes in contact with the other six research methods. He argued in favor of the value of Case Study as the meta-method, citing two reasons. “One major feature of case study methodology is that different methods are combined with the purpose of illuminating a case from different angles: to triangulate by combining methodologies” (Johansson, 2003, p. 3).

The other reason Johansson cited was this:

\begin{quote}
“the case study has a special importance. The ability to act within professional practice is based on knowledge of a repertoire of cases. These cases are based either on personal experience or are model cases established within the profession. Case studies contribute to the building of
\end{quote}

\textsuperscript{12} This study investigated whether case study was used in a similar manner to conduct and report on pedagogical research published in academic landscape architecture articles. Refer to Table 28.
a professional repertoire. A designer’s work is based on comparisons between known cases from the repertoire and the actual design situation (Schön 1991)” (Johansson, 2003, p. 4).

**Figure 3 Johansson’s conceptual framework for research methods**

Johansson’s conceptual framework for architectural research methods with Case Study as the connecting meta-method was modeled after Groat and Wang (2002). Johansson reported that the combination of qualitative and quantitative approaches was well established through case study, while other combinations of methods lagged behind.\(^{13}\)

2.6.16 Conclusion to the third section of literature review

This literature review found evidence that studio educators in practice-based disciplines have engaged in pedagogical research within the design studio environment. This finding strengthened the argument that a transition from Blauch’s second to third stage of education has taken place in the studio. Blauch’s second stage of transition was centered within an academic design studio environment separated from, but often mimicking, professional practice through the design process (Schön, 1983). The third stage began following the publication of Boyer’s model of scholarship, as teaching faculty in profession-based

\(^{13}\) All seven of Groat and Wang’s architectural research methods were used to sort the SWOTL articles in this study.
disciplines began to search for ways to integrate theory-based education within various apprenticeship experiences. This transition was informed by Donald Schön’s original descriptions of reflection-in-action, reflection-on-action, learn-by-doing and think-in-action. Schön’s description of the design process helped codify it as a scholarly endeavor worthy of its own pedagogical theory and research.

As design scholars engaged in discussing design theory and assessing how it affected teaching and learning activities, new and broader definitions of scholarship of teaching became associated with the design process. Design educators looked for opportunities to participate in theoretical discourse in their areas of expertise. Design educators at the Open University, London took the Boyer challenge and have benefitted from their collaboration. In 1991 a symposium was initiated by Nigel Cross and others to discuss research in design thinking (Cross, et al., 1992) (Cross, 1999). This relatively small international meeting led to annual symposia and papers published through Design Studies, a journal that “reports on new research and scholarship... relevant to pedagogy of design” (Cross, 2010, p. 1). These were some of the first design scholars to begin using Boyer’s criteria to study the design studio as an educational learning environment. Pedagogical research of this rigor illustrates a point made by Cross when he wrote; “looking back to 1991, it is perhaps difficult to recall just how little ‘research in design thinking’ was going on compared with today” (Cross, 2010, p. 1).

Research in design thinking has been a successful collaborative research effort that has influenced the teaching and learning of studio-based design and problem-solving since 1990. Many design disciplines have participated. Research on design thinking is one example of how ‘bodies of knowledge’ may be shared across disciplines. Another example was Kersey’s work identifying shared ‘Bodies of Knowledge’ in the field of GIScience and landscape architecture. Healey and Weimer pointed out, “recent interest in scholarly work on teaching and learning has been accompanied by a move to more firmly wed pedagogical scholarship to the disciplines (Healey, 2000)” (Weimer, 2008, p. 1). Section three provided specific examples; first, was work on architectural research methods prepared by Linda Groat and Sherry B. Ahrentzen. Groat’s work was expanded with David Wang, and then adapted by Rolf Johansson for use in the landscape architecture studio. Johansson recently presented his work at a conference sponsored by the International Study Group on Multiple Uses of Land (ISOMUL) and CELA held in Maastricht, the Netherlands in May 2010. His presentation was titled Landscape Legacy: Landscape Architecture and Planning between Art and Science (Johansson, 2010). Work by Groat, et al., has continued to benefit faculty in landscape...
architecture and architecture when formulating comprehensive, heuristic strategies and
guidelines for design studio teaching.

2.7 The studio teaching and research environment

2.7.1 Kenneth A. Feldman - the relationship between teaching and research
A long held assumption states that positive research behavior impacts teaching adversely. If
true, this would have an unfavorable impact on studio teaching and the scholarly productivity
of design educators. Kenneth A. Feldman’s work in the 1970s and 1980s made an early
attempt to collate information on the relationship between teaching and research (Feldman,
1987). His work at Stony Brook University suggested that “research productivity enhanced
certain pedagogical skills of faculty (for example, their knowledge, organization, intellectual
expansiveness, and clarity), but that rapport with students was independent of (or even
negatively related to) performance in research” (Olsen & Simmons, 1996, p. 33). The
Association for Institutional Research: Data and Decisions for Higher Education (AIR) has
supported the ongoing research versus teaching debate. Working with undergraduates, J.
Fredericks Volkwein and David A. Carbone have “found the most positive academic
outcomes for students occurred in departments that valued both teaching and research,
arguing that research productivity can benefit the instructional climate” (Olsen & Simmons,

Olsen and Simmons continued to study the relationship between teaching and research. They
found that undergraduates’ academic growth and integration into their preferred discipline
appeared to be positively influenced by faculty who were producing high level research.
These findings were good news for design educators, as they suggested research productivity
is not negatively influenced by teaching. Their investigation continued to identify positive
attitudes that affect teaching, research and learning performance. This finding supported
research conducted by Kevin Thwaites, who has written on ways to integrate some research
into studio-based tasks in the undergraduate landscape architecture studio (Thwaites, 2003).

2.7.2 Kristina Hill – integrating pedagogical research into the undergraduate studio
Kristina Hill has been a proponent of treating the undergraduate design studio as a primary
source of professional training for landscape architecture students. Toward this end, she has
recommended building problem-solving knowledge through studio-based teaching and
research. Hill has acknowledged that communicating pedagogical knowledge to a wider
audience is a key component in advancing professional training. However, implementing her recommendation may have been slowed for lack of a robust research culture.\(^\text{14}\)

### 2.7.3 George E. Walker - research and teaching

Traditionally, research and teaching activities were segregated from one another in the academe. George E. Walker\(^\text{viii}\) described the situation as follows. “The cloistered research environment” (Walker, et al., 2008, p. back fly page) has been traditionally set in opposition to “the faculty-teach interaction found in the apprenticeship tradition” (Walker, et al., 2008, p. 20). However, similarities do exist in the way “the university, by its very nature, treats scholarship in terms of not yet completely solved problems, whether in research or teaching” (Elton, 2009, p. 138). This perception of scholarship by the academe has provided opportunities for design educators to reinforce the way research and teaching activities come together in the studio.

Amalgamation of these two professions, research and teaching, began with the advent of Problem Based Learning (PBL) in the 1960s, “after scholars posited the principle of ‘research like learning’ (forschendes lernen). This method of learning became possible, at least in applied disciplines, particularly Medicine and Engineering, where there are ‘real’ problems” to be solved” (Elton, 2009, p. 138). Considering how well teaching might be credited as research, the design disciplines have been well-situated to spread their own version of PBL. Jaschik “has led the “research versus teaching” debate in favor of using educational activities in studio-based courses to enhance domain-specific scholarship” (Jaschik, 2005, p. 1).

Jaschik’s notion has brought together research, in the form of design activities, and teaching as an avenue toward achieving rigorous research. However, this idea has its challengers, like Lewis Elton, who in 2001 announced that “in practice, a general unity of research and teaching is probably impossible and certainly has never been established anywhere (Elton, 2001)” (Elton, 2009, p. 138).

### 2.7.4 Randy Bass - the problematization of teaching

Some faculty have considered scholarship of teaching to be a process of treating problems about teaching and learning about problems as scholarly endeavor. Randy Bass has described educators who treat “teaching practice, and the evidence of student learning, as problems to

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\(^\text{14}\) In landscape architecture this has included little undergraduate research money and fragmented interactions between faculty and students. Service learning is beginning to address this issue.
be investigated, analyzed, represented, and debated” (Bass, 1998, p. 1). In the following quote Bass described Deborah Loewenberg Ball and Magdalene Lampert’s impression on this topic.

“One telling measure of how differently teaching is regarded from traditional scholarship or research within the academy is what a difference it makes to have a "problem" in one versus the other. --- In scholarship and research, having a "problem" is at the heart of the investigative process; it is the compound of the generative questions around which all creative and productive activity revolves. But in one's teaching, a "problem" is something you don't want to have, and if you have one, you probably want to fix it. Asking a colleague about a problem in his or her research is an invitation; asking about a problem in one's teaching would probably seem like an accusation. Changing the status of the problem in teaching from terminal remediation to ongoing investigation is precisely what the movement for a scholarship of teaching is all about. How might we make the problematization of teaching a matter of regular communal discourse?” (Bass, 1998, p. 1).

The authors were interested in advancing scholarship of teaching, as well as advancing the ‘problem’ at the heart of the investigative process (Ball & Lampert, 1998-1999).

2.7.5 Berger and Corkery – encouraging robust scholarly discourse
Journal editors Alan Berger and Linda Corkery have suggested “it has been difficult at times for faculty to conduct rigorous scholarly discourse or to test and report on one another’s recommendations” (Berger & Corkery, 2003, p. 2). Their opinions were published in a 2003 guest editorial15 printed in the journal Landscape Review. They described the shortcomings of recent submissions to the journal from teaching faculty. They criticized both method and content of the essays saying; “the vast majority of articles submitted for publication are scholastically weak” (Berger & Corkery, 2003, p. 2). They discussed15 providing publishing standards to improve the scholastic rigor of individual articles, in the belief that publishing guidelines might aid authors and peer-reviewers to strengthen the literary content and quality of academic article submissions. These editors’ resolve to improve scholarly standards appeared to resonate with Weimer’s belief, e.g., the time is right to assess previously

15 Based on these discussions, the researcher of this study was interested in providing a baseline of scholarly rigor for pedagogical research methods for the academic articles authored by studio educators and published in Landscape Review and other discipline-based journals. See Table 16 and Table 18.
published work in order to establish a baseline of acceptable scholarly rigor for new article submissions.

Journal editors have discussed ways to encourage more synergistic discourse among studio educator-authors conducting pedagogical research in the United Kingdom, the United States, Australia, Canada and other countries. They have presumed more discussion will help build pedagogical theory (Berger, et al., 2003a). Toward this end, they have encouraged international authors, novice scholars, and faculty from allied disciplines to join in the discussions. It will be important to track their rates of response and to determine whether scholarship becomes more robust over the coming years based on a broader cross section of authors.

Journal editors have excused the lack of academic rigor in some articles as due to lax research design or a lack of attention when reporting findings. Insufficient academic rigor, which may be improved through reflection-on-teaching in the design studio (Schön, 1987) was especially evident where a robust understanding of discipline-specific knowledge was essential. Lax research standards may be further evidence of the ‘intellectual disarray’ spoken of by Stephen Krog or simply a lack ‘of an established research tradition’ cited by Selman. Regardless of the reason, lack of scholarship has been understood as a problem. Remedying the problem is vital to the discipline gaining scholarly standing in the academe.

2.7.6 Paul H. Selman – encouraging robust scholarly discourse

Selman, editor of Landscape Research, claimed that the lack of academic rigor found in many studio-based articles was due to a weak argument or for want of debate. Selman suggested studio educators need to be better trained as researchers. If what Selman and other journal editors have said about the lack of scholarly rigor in studio-based research is true, then landscape studio faculty “must be encouraged to take the opportunity to be better trained

16 This study cataloged author’s country affiliation, article’s disciplinary and interdisciplinary citations and author’s reason for publishing in three discipline-based journals published between 1997 and 2008.
17 This study assessed the academic rigor of research design using Weimer’s classification scheme. Articles were sorted based on whether they transferred findings to the reader, provided a challenge for the future, reported a paradigm shift, were published as a condition of funded research, or made a new or significant comment that had an effect on the existing body of problem-solving knowledge.
18 This study examined selected academic articles to determine whether authors supported their argument with statistical data, posed a new question, published other work on this topic, or wrote in response to recently published articles by other scholars.
as scholars” (Selman, 1998, p. 195). Or, it might be argued, these articles belong to a narrowly defined topic with a small pool of active researchers. The result being little synergistic discourse.

2.7.7 Helen Armstrong - generators of new knowledge

The year after Selman’s article was published, Helen Armstrong responded with a remedy for the lack of scholarship being cited by journal editors. Armstrong recommended identifying generators of new knowledge in landscape architecture. In her richly detailed article, Design studios as research: an emerging paradigm for landscape architecture, she talked about applied approaches to design vs. conducting theoretical discussions on design. She identified three forms of research potential for the design studio19.

1) “education research to pioneer and pilot new approaches to teaching,
2) consideration of the design studio and its outputs as a theorized creative work, and
3) the studio as part of a larger research programme”

(Armstrong, 1999, p. 6).

From the time of its publication, Armstrong’s article has influenced many studio educators and sustained conversation amongst them lasting well over a decade. During that time, studio educators have advanced service-learning, interdisciplinary, and collaborative projects as generators of new knowledge (Birksted, 2003). Some recommended approaches have been similar to those used in the profession. Other approaches have introduced cross-cultural and international education to the studio-learning environment (Bull, 2004) (Kirkwood, 2004) (Hill, 2005). Many studio educators have aided their students in exploring creative solutions, as opposed to finding a single correct answer (Roberts, 2006) (Jefferies, 2006) (Seymour, 2008). Seymour showed how landscape students expressed their ideas graphically, verbally, and in written form whether designing a project on their own or as a member of a multi-disciplinary team (Seymour, 2008). Patricia McGirr and Joni Palmer incorporated poetry into their studio exercises, referencing Ian Hamilton Finlay and other poets. Studio educators say these exercises have improved their students’ ability to explore creative solutions to spatial

19 Armstrong’s work was influential in the early phase of developing this study. The researcher of this study asked two questions. How do scholars and students approach the generation of new knowledge? What tools or methods do they use to generate innovative new ideas and to solve problems?” (Armstrong, 1999, p. 6).
temporal problems, resolve complex cultural and environmental issues, and mimic challenges facing them as practitioners.

2.7.8 Jan Kenneth Birksted – theory as a generator of solutions
Jan Kenneth Birksted’s article titled Landscape History and Theory: From Subject Matter to Analytic Tool introduced the idea that landscape theory and garden history were generators of solutions. Birksted mentioned the use of “narrative, space/time, representation, rhetoric, and focalization” (Birksted, 2003, p. 5) to build theory; and he described how these diverse ways of thinking and working could provide foundational knowledge on which to build theory. Birksted’s article addressed practice, not education, however his concern over a lack of theory in landscape architecture may be extended to teaching. One way Birksted encouraged theory building was by changing the research culture. He suggested that “one index of change might be in the number of new journal articles addressing recommended problem-solving approaches to handle complex problems in landscape architecture and interdisciplinary programs” (Birksted, 2003, p. 5).

2.7.9 Sandra Lenzholzer and others – research through designing
The role of ‘research through designing’ (RTD) in the profession was mentioned in passing, because generating new knowledge in the profession directly influences studio pedagogy. In a May 2013 article by Sandra Lenzholzer, Ingrid Duchhart and Jusuck Koh, the authors argued that landscape architecture must articulate RTD methods that are best suited to the purpose of generating new knowledge. The article mentioned authors who have dealt with this topic in the past; “(Benson, 1998, Brown and Corry, 2011, Deming and Swaffield, 2011, Milburn et al., 2003, Milburn et al., 2001 and van den Brink and Bruns, 2012)” (Lenzholzer, et al., 2013, p. 120).

Of the works listed by Lenzholzer, et al., the Deming and Swaffield book has described what has been occurring as the discipline of landscape architecture expands and engages with other

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20 In the early stages of developing this study, the researcher made use of two of Birksted’s ideas. First, the researcher applied Birksted’s suggestion to examine academic articles that addressed recommended problem-solving approaches through a key word search. Second, the researcher found Birksted’s generators of solutions interesting, especially the ‘visual’ ones. This prompted the researcher to search for landscape architecture faculty who were actively working on building studio-based theory.

21 This study conducted an abstract review of 467 articles to determine which articles announced new discoveries.
disciplines. Deming and Swaffield have suggested there is a need to broaden and deepen academic thinking; as ‘production and consumption of knowledge is the ‘new normal’ in landscape architecture academia’ (Deming & Swaffield, 2011). This positive response to Armstrong’s plea for new knowledge has moved forward landscape architecture’s maturation as a discipline, just as Blauch predicted.

The Lenzholzer article conducted an international literature content analysis of the ways landscape architecture and allied disciplines approach research through designing to determine how the ‘new normal’ might influence studio pedagogy. The article set parameters for the kinds of new design knowledge being generated. Lenzholzer, et al. found that,

“in relation to other disciplines, we see landscape architectural ‘designing’ employed in RTD processes as the unique skill of landscape architects to contribute to generation of new knowledge – a proficiency that cannot be easily replaced by other disciplines ‘research skills’” (Lenzholzer, et al., 2013, p. 126).

2.7.10 Kathryn Moore – training future landscape architects
Like Armstrong, Lenzholzer, Duchhart and Koh, Kathryn Moore has written about the unique skills landscape architects contribute to the generation of new knowledge. Moore has been an active proponent of training landscape architecture students to solve problems. While serving as president of the Landscape Institute, she spoke to members of the House of Commons, London. She described unique skills held within the discipline of landscape architecture and obvious implications for the teaching of design (Moore, November 2004). “… In order to train landscape architecture students to be responsible designers of public places and spaces…” (Moore, 2005, p. 12), she has argued “in favor of utilizing… visual skill, artistic sensibility, creativity, intuition, and imagination, qualities that are generally held to be insubstantial, if not insignificant, in comparison to the so-called linear, logical rationality of language and intelligence that is so much part of our culture” (Moore, 2006, p. 1). Moore has claimed, “We can change the nature in much of design discourse by redefining the relationship presumed to exist between the senses and intelligence by defining visual skill as a critical, teachable analytical ability” (Moore, 2001, p. 13). She went on to challenge landscape architecture educators “to encourage students to think in a different way,

22 Inspiration for this study was sparked, in part, as the researcher read about Moore’s quest to identify unique skills held within landscape architecture that were deemed essential to the training of future landscape architects
asserting that their designs could have a substance and logic that was valid and explicable” (Moore, 2005, p. 12).

2.7.11 Beverly Steffert and Edward de Bono – explicit problem-solving skills
Two scholars who influenced this researcher early in the discovery phase of this study were Beverly Steffertxi and Edward de Bono xii. Steffert, along with Ian Padgett, published on creative aspects of dyslexic thinking (Steffert & Padgett, 1999), while de Bono published on creativity in general (de Bono, 1985). Respectively, these educators developed popular ways of teaching students explicit problem-solving skills. Their methods are known to enhance innovation and creative thinking in the studio setting. Steffert’s work comes from the visual arts and de Bono’s comes from business psychology. Steffert has published research articles on her students’ design abilities, utilizing visualization, short term memory, power and speed. Research by de Bono has focused on lateral thinking, a term he coined to describe clear-cut alternative paths toward problem resolution. Both Steffert and de Bono23 believe in imparting problem-solving skills that have the power to transform a concept into reality, whether in a surprising, humorous, or even magical manner.

2.7.12 Conclusion to the fourth section of literature review
Recent academic articles published on problem-solving topics provided insight into certain types of scholarly productivity taking place in the discipline of landscape architecture. Some articles showed positive amalgamation of research and teaching. According to Bass, scholarship of teaching may be considered a process of treating problems about teaching and learning about problems as scholarly endeavor. Some articles articulated the use of teaching theories. Ball and Lampert’s perspective on the problem at the heart of the investigative process linked several theories together. These included theories posited by Hill, which involved the design studio as a primary source of professional training for landscape architecture students, by Moore, which encouraged students to design with substance and logic that was valid and explicable, by Schön, which prepared students to reflect-in-action and reflect-on-action, by Kersey, which utilized the primary body of problem-solving knowledge, by Blauch, which advanced landscape architecture to his third stage of education,

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23 This researcher saw similarities in Steffert’s and de Bono’s explicit approaches to teaching students to solve spatial temporal problems and issues faced by landscape studio educators. The format of this study’s research questionnaire was influenced by Steffert’s work; explicit problem-solving categories were influenced by de Bono’s work.
by Groat, et al., which utilized architectural research methods in collaboration with allied
disciplines, by Jaschik, which brought together research in the form of design activities and
teaching as an avenue toward achieving rigorous research, and by Boyer, which expanded
definitions of teaching scholarship. These theories influenced how studio-based pedagogical
problem-solving knowledge has been communicated over the past twenty years.

Armstrong’s article on generating new knowledge in the studio influenced many studio
educators including Birksted who described how these diverse ways of thinking and working
could provide foundational knowledge on which to build theory. Many authors contributed to
the generation of new knowledge and proposed ways to improve the scholarship of
academically weak articles submitted for publication.

For years, journal editors have discussed providing publishing standards to strengthen the
literary content and quality of academic article submissions. Benson has called for educators
to make explicit their body of problem-solving knowledge through academic articles. Deming
and Swaffield have called for broadening and deepening academic thinking. Journal editors’
resolve to improve scholarly standards appeared to resonate with CFAT educational scholars,
notably with Weimer’s work. She recognized the time was right to assess previously
published SWOTL\textsuperscript{24} in order to establish a baseline of acceptable scholarly rigor for future
article submissions.

2.8 Integrating teaching and research in the landscape architecture studio

2.8.1 Ervin Zube – stretching the boundaries to produce scholarly work
Establishing a robust research culture has not come easily to the discipline of landscape
architecture. More often than not, landscape architecture faculty have looked to the
profession to govern their design work, teaching efforts and scholarly work rather than look
to the academe for guidance. Ervin Zube was well aware of the constraints this professional
perspective placed on faculty. He complained to his colleagues at The Conference on
Research in Landscape Architecture in 1980 that “academic programs have far too frequently
elected to define their role as following current perceptions of professional practice rather
than also stretching the boundaries and leading” (Zube, 1980, p. 4).

\textsuperscript{24} A flurry of published work took place in the late 1990s and early 2000s focused on advancing
pedagogical problem-solving knowledge. Three journals provided data for this study.
However, the research culture has been changing like Birksted predicted. Contemporary landscape architecture faculty, unlike their predecessors, experience tremendous pressure to produce scholarly work. They have been encouraged to conduct and disseminate rigorous scholarship, rather than merely publishing anecdotal articles about studio curriculum, community projects or personal teaching experiences. In effect, this literature review confirmed the need for robust Wisdom of Practice literature because it has scholarly potential for stretching boundaries to produce scholarly work. Applying Weimer’s constructs for publishing robust Wisdom of Practice literature may mean faculty no longer must look to the profession to govern their design work, teaching efforts, or scholarly work. It may be possible to use pedagogical research standards as guideline’s to establish a more robust research culture within the teaching and learning environment of the landscape studio.

2.8.2 Elizabeth Gillespie – preparing for the task of writing and researching
The recent prevalence of graduate students in the academe and their capacity to bring intellectual expertise to scholarly work has provided a situation quite different from the past. Elizabeth Gillespie, a graduate student at the University of Georgia, brought up an interesting point concerning the emphasis placed on scholarship in the discipline of landscape architecture. In her 2006 master’s thesis, she noted “there has been virtually no published information on the fact that… less than 20% of MLA students are now writing thesis. If this is a concern, and it should be, where is the discussion and analysis of this trend?” (Gillespie, 2006, p. 53). Gillespie expressed nearly the same concern as the one expressed by Zube in 1980, when he complained about academic programs needing to stretch their boundaries and lead. There may be no doubt that Gillespie was concerned. She quoted E. Brandon, a graduate student at Louisiana State University, as saying, “landscape architecture faculty, by not preparing graduate students for the task of writing and researching, are doing a disservice to the students and the profession at large (Brandon, 2005)” (Gillespie, 2006, p. 61). Concern expressed by these graduate students remains similar to concern expressed by Berger, Corkery and Moore over the fate of academically weak articles submitted for publication (Berger, et al., 2003a). They discussed this issue at a Conference on Researching the Studio held at The University of Central England, Perry Barr Birmingham in the United Kingdom and also published this discussion in an editorial in *Landscape Review* (Berger & Corkery, 2003).
2.8.3 Paul H. Gobster and others – scholarly productivity

Scholars and editors have considered the discipline of landscape architecture remiss in establishing a robust research culture amongst teaching faculty. There appeared to be many causes for this situation. Selman has suggested that the difficulty in establishing a robust research culture among faculty was due to the lack of “proper research training” (Selman, 1998, p. 196). Weimer has suggested disciplinary knowledge may be highly specialized, thereby, making generalizable definitions and evaluation criteria difficult to develop. The Landscape Journal recently published a study on the research culture amongst teaching faculty.

A 2010 article by Paul H. Gobster, Joan Iverson Nassauer, and Daniel J. Nadenicek titled, Landscape Journal and Scholarship in Landscape Architecture: The Next 25 Years, Gobster, et al., provided data on scholarly productivity as it has been taking place in the field of landscape architecture. Gobster, et al., examined the 1999-2008 publication records of 284 faculty members in landscape architecture programs in the United States. Faculty from ”30 research-oriented graduate programs of landscape architecture” (Gobster, et al., 2010, p. 52) participated in the survey. Survey participants were screened to limit the sample to faculty with landscape architecture degrees, eliminating ecologists and other disciplinary specialists who might be affiliated with landscape architecture programs. Information on publication rates was gleaned from articles in Landscape Journal listed in Scopus and the Avery Index of Architectural Periodicals. Gobster, et al., found that just six percent of faculty published at least one article per year for the 10 year period: a total of seventeen productive scholars. “This is a low publication rate compared with other scholarly disciplines” (Gobster, et al., 2010, p. 58). Besides, these seventeen faculty members were not necessarily reporting on pedagogical topics: there were eleven categories listed under which faculty might have published. To quote one junior faculty member at the 2013 CELA Conference, “You can argue with the study's methodology (or about the definition of productive scholar), but I suggest that the low number is plausible” (Bryant, 2013). More confirmation of low publishing rates came from Milburn et al., in an analysis of landscape faculty’s self-reports on the number of refereed papers published from 1996 through 1998 (Milburn, et al., 2001).

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25 The researcher of this study noted that the Gobster, et al., study involved gathering data from 1999-2008 publication records of faculty while this study examined data from 1997-2008 academic articles authored by teaching faculty. It may be, some faculty participating in the Gobster et al. study authored articles used in this study.
Gobster reported Milburn et al., “found that 64 percent of their sample reported one or no publications over the three-year-period of their study and that about 11 percent reported more than one publication per year” (Gobster, et al., 2010, p. 58).

2.8.4 Heidi Hohmann and Joern Langhorst—criticism redoubled
One of the worst indictments directed at the lack of scholarship in landscape architecture must be Heidi Hohmann and Joern Langhorst’s *Landscape Architecture: An Apocalyptic Manifesto* written in 2004 from Iowa State University. In their manifesto, they “suggested that the discipline of landscape architecture “no longer maintains vital connections to other academic fields; rather landscape architecture has turned to the parasitic activity of borrowing from others without creating new ideas... anything landscape architecture does... there is another field that can do it, and do it better” (Hohmann & Langhorst, 2004, p. 15). Hohmann and Langhorst based some of their assertion on Steven R. Krog’s oft quoted observation: “Landscape architecture is a discipline in intellectual disarray with a deficiency of theoretical discourse” (Krog, 1981, p. 372). Few scholars have protested his assertion, choosing instead to agree with him (Krog, 1985) (Thwaites, 2003) (Hohmann & Langhorst, 2004).

In the ensuing years, necessity has required searching for “a fruitful area of research, and one particularly relevant to the demands of contemporary higher education” (Jefferies, 2007, p. 495). Karl K. Jefferies described this area of research as having the potential to combine creative diagnostic tools with design pedagogy. In an effort to establish viable research, Jefferies said scholars have written about teaching their students to solve problems. This topic has proven to be popular, if anecdotal in nature. It has fostered discovery and it has extended domain-specific knowledge beyond previously known boundaries. Scholars understand that whether discovery originates in the lecture hall or design studio, success depends on rigorous scholarly discourse to bridge the gap between pioneering knowledge and teaching. Robust research needs scholars and students who will question, test and build theory through scholarly discourse.26

2.8.5 Integrating teaching and research in the undergraduate landscape studio
During Selman’s tenure as editor of the journal *Landscape Research*, he expressed concern over the marginalization of landscape architecture as a respectable field of scholarship. His

26 This comment led the literature review back to the discussion about integrating teaching and research in the landscape studio.
advice was this; since landscape architecture is “a discipline without an established research
tradition, it follows that new methods of evaluation will be needed to identify viable
research” (Selman, 1998, p. 24). Included in his counsel was recognition that design faculty
need to embrace new methods of conducting and disseminating pedagogical research. Put
another way, ‘they need to be about designing teaching research’. Selman invested in
searching for new ways to strengthen the studio learning environment. One recurrent debate
under his tenure as editor concentrated on whether, “teaching and research can be integrated
in some studio-based tasks at the undergraduate level” (Thwaites, 2003, p. Abstract). Selman
was aided in developing this concept by Kevin Thwaites.

Paul H. Selman and Kevin Thwaites have written on how teaching and research can be
integrated in some studio-based tasks in the undergraduate landscape architecture studio
(Selman, 1998) (Thwaites, 1998) (Thwaites, 2003). They have described situations where
studio educators have systematically required their students participate in undergraduate
research projects as part of the studio teaching and learning experience. Students have also
participated as subjects in pedagogic research projects. In these cases, studio teaching and
research productivity have resulted in published scholarly work. These discussions provoked
the question: What further evidence do we have that research on teaching and learning has
been taking place in the undergraduate studio?

2.8.6 Kevin Thwaites – training scholars
Thwaites’s writings on studio activities and the Research Assessment Exercise (RAE) in the
United Kingdom were included in the 1998 publication of Landscape Research (Thwaites,
1998). It was evident from reading the journal issue, and from Selman’s editorial, that many
landscape architects were using the debate to treat imaginative original design solutions as
being equal to refereed journal articles. This resulted in landscape architecture faculty putting
more emphasis on original design solutions and not participating wholeheartedly in
“receiving a proper research training or (taking time) to discover the benefits of integrating
self-critical inquiry with innovative design” (Selman, 1998, p. 196). These articles hinted at
the need for further research training for faculty teaching design, but no mention was made of
the emerging new discipline known as the scholarship of teaching and learning. Rather,
Thwaites recognized “that there have been difficulties in landscape architecture – establishing
a research culture” (Thwaites, 2003, p. 13). He claimed two main reasons for this problem:
funding and the original assertion by Krog (Krog, 1981) that brings into question landscape
architecture’s wider intellectual development as a discipline, namely that “landscape architecture is a discipline in intellectual disarray with a deficiency of theoretical discourse” (Thwaites, 2003, p. 13).

Gobster, et al., have also reported a lack of scholarship on the part of most landscape architecture faculty. They suggested a lack of scholarship may be due to lax research design or lack of attention when reporting findings. It may be caused by a weak argument or want of debate. Authors may be interested in sharing personal thoughts on their teaching experience or a one-off service-learning project, rather than focusing attention on more rigorous academic inquiry. Gobster, et al., concluded that discussions of individual ways of solving problems were not considered as scholastically rigorous as generalizing the experience. This conclusion was supported by Weimer’s research on SWOTL literature.

There have been positive responses to the challenge to improve academic rigor. First, by CELA presenters. Editors of Landscape Journal have encouraged diverse submittals. These have included research by graduate students and by colleagues from allied design disciplines (Council of Educators in Landscape Architecture, 2014). Second, Matthew Powers and Jason Walker have reported that “in recent years many new, highly specialized journals have become available to potential contributors” (Powers & Walker, 2009, p. 97). Some specialized journals are on-line, while others are print based. Some focus on specific social or environmental concerns, while others appeal to a broader readership. These journals contribute to the academic rigor of the discipline.

2.8.7 M. Elen Deming – contemporary social and environmental problems
In 2008 M. Elen Demingvi challenged contributing authors of Landscape Journal, “to concern themselves with significant contemporary social and environmental problems related to design, planning, and management of the land… (Deming, 2008)” (Gobster, et al., 2010, p. 68). According to Gobster, et al., Deming’s challenge substantially heighten landscape architecture’s contribution to solving societal problems as shown in positive academic outcomes for educators that valued both teaching and research. Further study will be needed27 to determine how this will be accomplished whether studio educators are involved.

27 This study examined scholarly contributions, in the form of academic articles, for nearly the same time period as Gobster, et al., and identified and cataloged several issues that related to solving complex cultural and environmental problems.
2.8.8 Conclusion to the final section of literature review

Each generation of landscape architects has been faced with establishing a research culture. According to Zube, faculty have looked to the profession to govern their design work, teaching efforts, and scholarly work (Zube, 1980). This section of this literature review aided readers in discerning that the lack of scholarly rigor goes back at least as far as 1981, when Krog made his manifesto describing landscape architecture as “a discipline in intellectual disarray with a deficiency of theoretical discourse” (Krog, 1981, p. 372). Since 1981, scholars have attempted to increase scholarly output through diverse theories and principles of landscape architecture. This has resulted in scholarly work deriving its framework ad hoc, as studio educators made an effort to establish viable teaching research utilizing familiar discipline-based methods. This is what Groat and Wang’s architectural research methods help to identify and catalog for this study.

Nevertheless, since 1990 design studio faculty have been provided opportunities for publishing scholarship of teaching literature. This type of pedagogical research originated from work conducted by The Carnegie Foundation for Teaching and gained scholarly standing in higher education as its rigor was tested. More recently, design studio faculty have produced scholarly work in interdisciplinary studios. Much of this work may be considered scholarly work on teaching and learning and valued by a wider readership, thereby, increasing its value as viable research.

Selman, speaking in 1998 described difficulty in establishing a robust research culture due to the lack of “proper research training” (Selman, 1998, p. 196). But times have changed. The quality of research must now meet rigorous academic standards. Standards set forth by the CFAT appeared to be worthy of further examination as faculty conduct and disseminate robust pedagogical research. Graduate students report they would like to be better prepared to conduct robust scholarship; as this would benefit them and the profession.

Throughout the literature review, scholars in the design disciplines claimed that discourse on the subject of teaching students to solve problems fostered discovery and extended domain-specific knowledge beyond previously known boundaries. This was true regardless of the rigor of the research. The literature review suggested many attempts have been made at establishing a robust research culture.
3 Methods

3.1 Multiple research methods
Multi-faceted topics may be successfully studied using multiple methods of examination (Gay, 1996). In the discipline of landscape architecture, studio-based problem-solving pedagogy has rarely been assessed using multiple survey instruments in a single study. However, when studio-based problem-solving pedagogy was viewed as an aggregate of pedagogies, it was considered a suitable topic for multi-method examination. This decision was based on literature that suggested a multi-method research approach held opportunities for discovery. Therefore, a multi-method research approach was used to gather data to possibly answer the primary research question: How has the landscape studio supported scholarly problem-solving pedagogy? Data was gathered from two points of view: from academic articles authored by studio educators writing on problem-solving topics (data set1) and from students resolving problems in the landscape studio (data set2).

3.2 Aims of the data collection
The overall aim of the data collection process was to gather information from reliable sources to answer the research questions. A reliable source for data collection was peer-reviewed academic articles authored by studio educators’ on pedagogical problem-solving topics. Three peer-reviewed scholarly publications were identified for review. These publications focused on advancing education in the discipline of landscape architecture. They could be searched for content and scholarly rigor using existing research methods. Problem solving tools, techniques and theories could be reliably identified.

Landscape architecture students provided another reliable source for data collection. Students were known to be directly involved in applying problem-solving tools, techniques and theories to their studio-based projects. They held potential for experimenting with new ways of identifying, integrating and applying problem-solving knowledge. Their preferences might vary depending on class ranking, gender or school. It was decided that understanding students’ preferences for solving studio-based projects would require a descriptive research approach. For these reasons, a multi-method research approach was taken that would allow triangulation of four different methods of inquiry. Students were asked to participate in a self-evaluation research questionnaire, a one-on-one interview with the researcher, a focus group and a formal project presentation in front of fellow students and faculty. Since the aim of the
data collection process was to gather reliable information, all first and final year landscape architecture students were asked to participate in two schools of landscape architecture: one was selected in the United States and the other was selected in Scotland. Location of schools was based on convenience for the researcher.

3.3 Overview of the data gathering process

3.3.1 Data set 1
A series of educational research methods were used to gather and examine the scholarly rigor of academic articles authored by studio educators and academic practitioners. Educational research methods were based on theories posited by scholars: Boyer and Mitgang, Cross and Steadman, and Weimer. These educational research methods were used in conjunction with Groat and Wang’s seven architectural, or non-pedagogical, research methods. Groat and Wang’s descriptions of architectural research methods were valuable because design studio educators traditionally use practice-based problem-solving techniques to train students to solve problems in the first and second stage of professional education (Blauch, 1962). This is common across the design disciplines.

Examination of specific academic articles was limited to those that represented studio educators’ and academic practitioners’ critical thinking on the teaching and learning of problem-solving topics. Content analysis was used to identify and record the mention of problem-solving tools, techniques or theories described by educator-authors as having pedagogical value for students working on studio-based problems.

3.3.2 Data set 2
Mixed research methods focused on identifying and cataloging landscape students’ preferred ways of discovering, exploring or resolving studio-based problems. Survey instruments included a research questionnaire, one-on-one interviews, focus groups and the researcher’s observation of students’ formal project presentations. These research methods were used to gather data from students interviewed while working on studio-based projects.

Comparisons were then made between problem-solving tools, techniques and theories listed in the two sets of data, e.g., the census of articles published in three academic journals and responses from students working in the landscape studio.
3.4  **Process of article selection – Data set 1**
A census of articles was examined from a possible 467 articles published in three discipline-specific journals between 1997 and 2008. The three journals were *Landscape Journal*, *Landscape Research* and *Landscape Review*. These were English print journals that were known to support pedagogical research conducted by landscape architecture faculty.

3.5  **Process of sorting academic articles by research method – Data set 1**

*Table 2  Process of sorting academic articles and gathering data – Data set 1*

<table>
<thead>
<tr>
<th>Process of sorting academic articles by research method</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selected a census of academic articles published between 1997 and 2008 in <em>Landscape Journal, Landscape Research</em> and <em>Landscape Review</em> (n =467)</td>
<td>Excluded all other materials</td>
</tr>
<tr>
<td>1. Applied Neuendorf’s content analysis</td>
<td>Excluded editorials, articles that made no mention of problem-solving topics, articles on K-12 education, and subjects outside of the landscape studio (n=347)</td>
</tr>
<tr>
<td>Sorted for articles that advanced the body of problem-solving knowledge (n=120)</td>
<td>Excluded editorials, articles that made no mention of problem-solving topics, articles on K-12 education, and subjects outside of the landscape studio (n=347)</td>
</tr>
<tr>
<td>2. Applied Boyer’s four models of scholarship</td>
<td>Excluded articles that qualified as scholarships of discovery, integration or application (n=52)</td>
</tr>
<tr>
<td>Sorted for articles that qualified as scholarship of teaching (n=68)</td>
<td>Excluded articles that qualified as scholarship of teaching (n=68)</td>
</tr>
<tr>
<td>3. Applied Weimer’s classification scheme for scholarly work on teaching and learning literature</td>
<td>Excluded articles that did not qualify as scholarly work on teaching and learning literature (n=0)</td>
</tr>
<tr>
<td>Sorted for articles that qualified as scholarly work on teaching and learning literature (n=56)</td>
<td>Excluded articles that did not qualify as scholarly work on teaching and learning literature (n=0)</td>
</tr>
<tr>
<td>4. Applied Cross and Steadman’s definition of multiple scholarships of teaching</td>
<td>Excluded articles that showed no evidence of multiple scholarships of teaching (n=0)</td>
</tr>
<tr>
<td>Sorted for articles having characteristics of multiple scholarships of teaching (n=56)</td>
<td>Excluded articles that showed no evidence of multiple scholarships of teaching (n=0)</td>
</tr>
<tr>
<td>5. Applied Groat and Wang’s definitions of seven architectural research methods</td>
<td>Excluded articles that showed no evidence that architectural research methods were being used in the landscape studio (n=33)</td>
</tr>
<tr>
<td>Sorted for articles that relied on named architectural research methods to generate or disseminate studio-based pedagogical problem-solving knowledge. This included the landscape architecture studio and interdisciplinary studios taught by landscape architecture faculty (n=23)</td>
<td>Excluded articles that showed no evidence that architectural research methods were being used in the landscape studio (n=33)</td>
</tr>
<tr>
<td>6. Applied Krippendorff’s Content analysis</td>
<td>Excluded articles that did not identify pedagogical problem-solving tools, techniques or theories by name (n=0)</td>
</tr>
<tr>
<td>Sorted for articles that identified pedagogical problem-solving tools, techniques and theories by name, using articles that qualified as SWOTL literature and had characteristics of MSoT (n=56)</td>
<td>Excluded articles that did not identify pedagogical problem-solving tools, techniques or theories by name (n=0)</td>
</tr>
</tbody>
</table>
3.6 Coding of articles – Data set 1
Coding criteria was unique for each of the six research gathering methods. The process of sorting academic articles and gathering data began with the reading of each article’s abstract, key words and full text by two coders. The coders were the researcher and a fellow graduate student. A third coder, the Director of Interior Design at Washington State University’s Interdisciplinary Design Institute, read and made final coding decisions when an article’s suitability was contested by one or both coders.

3.7 Pre-test – Data set 1
Testing of the coding criteria was conducted on three sample articles from the journal Design Studies before the reading of the 467 articles for this study took place. The three coders participated in reading and sorting the sample articles.

3.8 Description of the sorting process – Data set 1
The first sorting of articles used Neuendorf’s qualitative content analysis (Neuendorf, 2002) to identify key words and phrases associated with solving problems: problem, problem-solving, problem resolution, or problem-solving process.

The second sorting of articles was based on Boyer’s Model of Scholarship (Boyer, 1997). Boyer’s expanded definition of scholarship was used to sort articles for evidence of scholarship of teaching versus the other three types of scholarship: discovery, integration, and application.

The third sorting was based on Weimer’s classification scheme for assessing scholarly work on teaching and learning authored by faculty in disciplines other than education (Weimer, 2006). This required reading the entire article – often the last paragraph contained a generalizable bit of wisdom. Academic articles were examined to determine whether they contained evidence of scholarly work that proved generalizable, replicable and, or, transferable and contained pedagogical knowledge of interest to a wider audience of educators. If so, articles were assigned to one of three categories of SWOTL literature: wisdom of practice, research scholarship, or promising possibilities. These categories were based on the relatability of each article to inform faculty outside the discipline of landscape architecture about generalizable studio-based teaching and learning practices. More specific details were provided through the sorting of SWOTL articles into ten subcategories based on Weimer’s specifications detailed coding criteria were used for the articles.
The fourth sorting of articles relied on Cross and Steadman’s definition of multiple scholarships of teaching known to “transmit, transform and extend knowledge generated in the classroom” (Cross & Steadman, 1996, p. 28). Cross and Steadman built their narrowly delineated definition of multiple scholarships of teaching on Boyer’s broader definitions of the scholarships of discovery, integration, application and teaching. To better describe the types of scholarship of teaching articles contained in data set 1, this study resorted articles using Cross and Steadman’s definition of multiple scholarships of teaching. Later, during data analysis, articles possessing characteristics of Cross and Steadman’s multiple scholarships of teaching were linked with the ten subcategories of Weimer’s SWOTL literature.

The fifth sorting of articles used Groat and Wang’s descriptions of seven architectural research methods (Groat & Wang, 2001) to identify articles where practice-based or non-educational research methods had been used to conduct and disseminate pedagogical research from the landscape studio. This sorting also assisted in determining whether interdisciplinary collaboration had taken place in the landscape studio, as interdisciplinary collaboration has been known to advance problem-solving knowledge across disciplinary boundaries.

The sixth sorting utilized Krippendorff’s open-ended key word protocol. This sorting focused on each article’s content, rather than its scholarly rigor. Studio-educators’ recommended problem-solving tools, techniques and, or, theories were cataloged and ranked according to the most frequently mentioned problem-solving approaches. The pedagogical value of authors’ recommendations were assumed because articles had been vetted as SoT, MSoT and SWOTL literature.

Later, the list of studio-educators’ most recommended problem-solving tools, techniques and theories was compared to a list of landscape students’ most preferred ways of solving studio-based problems. This allowed the researcher to better understand the history of problem-solving as it had taken place between 1997 and 2008.
### 3.9 Process of gathering students’ responses – Data set 2

Table 3 Process of gathering students’ responses – Data set 2

<table>
<thead>
<tr>
<th>Research questionnaire</th>
<th>One-on-one interviews</th>
<th>Focus groups</th>
<th>Observation of students’ formal project presentations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students’ preference responses were screened by key words and phrases based on frequency of mention of specific problem-solving tools, techniques and theories</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class Ranking</th>
<th>Gender</th>
<th>School</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Year</td>
<td>Male</td>
<td>ECA</td>
</tr>
<tr>
<td>Final Year</td>
<td>Female</td>
<td>WSU</td>
</tr>
</tbody>
</table>

A multi-method research approach was used to gather data to better understand which specific problem-solving tools, techniques and theories landscape students preferred to use to discover, explore or resolve studio-based problems. Responses came from equally weighted cohorts of male and female first and final year landscape architecture students at ECA and WSU. Their responses were gathered using a research questionnaire, one-on-one interviews, focus groups, and the researcher’s observation of students’ formal project presentations.

Results from the four research methods were triangulated and used to develop the final list of preferred problem-solving tools, techniques and theories. The ranking of approaches was based on the number of students reporting each type of problem-solving tool, technique or theory. The researcher summarized this data and converted it to key words using Krippendorff’s open-ended key word protocol (Krippendorff, 2004).

Lastly, Gay’s method of educational research analysis (Gay, 1996) was used by the researcher to compare the mention of key words in the two lists: data set 1 and data set 2. This task was carried out to test whether what studio-educators claimed in their academic articles was supported by evidence from students who reported their preferred methods of resolving problems in the landscape studio.

### 3.10 Description of methods selected to possibly answer the research questions

The following discussion of research methods was presented in the same order as the research questions were presented in Chapter 1.

#### 3.10.1 Research method selected to possibly answer question 1

Has the landscape studio supported research on problem-solving tools, techniques or theories?
The researcher devised an open-ended checklist to record key words, phrases and concepts used by authors to advance the body of problem-solving knowledge. Many of the key words came from articles written by authors interested in encouraging their readers to think critically about complex cultural and environmental issues and to master essential problem-solving tools, techniques and theories. Key words were examined within the contextual framework of each article’s abstract and full text. Krippendorff’s qualitative approach to content analysis served as a lens through which the data was gathered, analyzed, relationships constructed and research question 1 was possibly answered.

3.10.1.1 Coding criteria for identifying problem-solving approaches – Data set 1

Table 4 Coding criteria for identifying problem-solving approaches – Data set 1

<table>
<thead>
<tr>
<th>What was the problem-solving approach?</th>
<th>Key word, phrase, or concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>How was the key word used in the article?</td>
<td>Identify each key word that confirms that a problem-solving approach is being discussed</td>
</tr>
<tr>
<td></td>
<td>Define the key word within the problem-solving context for landscape architecture</td>
</tr>
<tr>
<td></td>
<td>When compared to other articles, is the key word defined differently, the same or not at all?</td>
</tr>
<tr>
<td>Was the definition of the problem-solving approach made explicit in the description?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>How was it categorized?</td>
<td>As a tool, instrument, means, device?</td>
</tr>
<tr>
<td></td>
<td>As a technique, method, process, practice, skill?</td>
</tr>
<tr>
<td></td>
<td>As a theory, model, idea, scheme, design?</td>
</tr>
<tr>
<td></td>
<td>As a strategy, plan, approach, or tactic?</td>
</tr>
<tr>
<td>How was it taught?</td>
<td>In the design studio?</td>
</tr>
<tr>
<td></td>
<td>In teams or groups?</td>
</tr>
<tr>
<td></td>
<td>On-site? Or through a site visit?</td>
</tr>
<tr>
<td></td>
<td>As a service-learning exercise?</td>
</tr>
<tr>
<td></td>
<td>Over the WEB?</td>
</tr>
<tr>
<td></td>
<td>In a lecture setting?</td>
</tr>
<tr>
<td>Was this a recommended interdisciplinary approach?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>If so,</td>
<td>Define it within the context of the landscape architecture studio</td>
</tr>
<tr>
<td></td>
<td>Define it within the context of an interdisciplinary studio</td>
</tr>
<tr>
<td>What does the author say about this particular problem-solving approach?</td>
<td>In terms of usefulness</td>
</tr>
<tr>
<td></td>
<td>Potential pedagogical value</td>
</tr>
<tr>
<td></td>
<td>Transferability to/from other areas or disciplines</td>
</tr>
<tr>
<td></td>
<td>Note key authors</td>
</tr>
<tr>
<td></td>
<td>Note interdisciplinary vs. disciplinary value</td>
</tr>
</tbody>
</table>
Table 4 showed the open-ended check list prepared and used by the researcher and a fellow graduate student to record all problem-solving approaches mentioned in the academic articles. The checklist begins to answer whether an article is scholastically robust based on Weimer’s definition of SWOTL literature. Academic articles that did not mention problem-solving tools, techniques or theories were excluded from further examination. Articles focused on professional development were also eliminated.

Next, articles that mentioned one or more approach to problem-solving were sorted using Boyer’s Model of Scholarship to determine whether the article qualified as scholarship of teaching literature.

3.10.2 Research method selected to possibly answer question 2

Has the landscape studio supported studio educators’ publication of scholarship of teaching literature?

The following coding criteria for scholarship of teaching articles was based on Boyer’s Model of Scholarship. Boyer’s definitions of four models of scholarship were used to determine whether articles that mentioned problem-solving topics in their abstract, key words or full text also contained evidence of scholarship of teaching. This was critical data to gather and analyze in order to determine the condition of academic practitioners’ pedagogical research, and whether it might be beneficial to supply them with guidelines for conducting and disseminating SWOTL literature.

3.10.2.1 Coding criteria for Scholarship of Teaching articles – defined by Boyer’s Model of Scholarship – Data set 1

Criteria in Table 5 were used to sort articles into two categories: 1) scholarship of teaching literature, which narrowly focused on teaching topics related to problem-solving activities and 2) non-qualifying literature, which was general in nature, albeit practice, research or service oriented. Non-qualifying articles possessed characteristics of scholarships of discovery, application and, or, integration. They were excluded from further review.
Table 5  Coding Criteria for Scholarship of Teaching articles – defined by Boyer’s Model of Scholarship – Data set I

<table>
<thead>
<tr>
<th>Boyer’s Model of Scholarship</th>
<th>Non-qualifying literature</th>
<th>Qualifying scholarship of teaching literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovery</td>
<td>Evidence that new or unique problem-solving knowledge was being generated or reported within the discipline not specifically related to teaching and learning.</td>
<td></td>
</tr>
<tr>
<td>Application</td>
<td>Evidence that domain-specific knowledge was used to solve society's problems outside the studio teaching and learning environment.</td>
<td></td>
</tr>
<tr>
<td>Integration</td>
<td>Evidence that new relationships among disciplines were being established to solve complex cultural or environmental problems unrelated to the studio.</td>
<td>Evidence that studio educators were creatively building bridges between their own understanding and their students’ learning of the problem-solving process. Authors self-identified as studio educators.</td>
</tr>
<tr>
<td>Teaching</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Some articles only mentioned aspects of scholarship of teaching or learning in the conclusion of the article. Careful reading of each full text was required to identify these transitional articles. They were sorted again using Cross and Steadman’s taxonomy of multiple scholarships of teaching and learning. This was done to assure that each article in data set 1 was defined within a narrower teaching focus.

See Table 6 for coding criteria used to sort pedagogical and transitional articles based on Cross and Steadman’s definitions for multiple scholarships of teaching.
3.10.2.2 Coding criteria for multiple scholarships of teaching articles – Data set 1

Table 6 Coding Criteria for multiple scholarships of teaching articles – Data set 1

<table>
<thead>
<tr>
<th>Cross and Steadman’s multiple scholarships of teaching</th>
<th>Description of qualifying literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovery</td>
<td>Evidence that new or unique knowledge had been generated or reported related to pedagogical problem-solving activities in the studio. Evidence that new discoveries specific to problem-solving were being made in the landscape studio teaching and learning environment.</td>
</tr>
<tr>
<td>Application</td>
<td>Evidence that domain-specific knowledge was being taught to students as a way to solve one or more of society’s cultural or environmental problems. Frequently articles on application mention community and service-learning projects conducted by a studio tutor outside the studio.</td>
</tr>
<tr>
<td>Integration</td>
<td>Evidence that teachers were effectively transmitting problem-solving knowledge to their students in interdisciplinary studios or evidence that discipline-specific problem-solving knowledge was shared through interdisciplinary collaboration where students shared problem-solving knowledge.</td>
</tr>
<tr>
<td>Teaching</td>
<td>Evidence that approaches to teaching students to solve problems were pedagogically rigorous and studio based.</td>
</tr>
</tbody>
</table>

Criteria in Table 6 were used to sort articles into two categories: 1) articles narrowly focused on teaching topics and 2) transitional articles that briefly mention teaching topics.

Later, articles having attributes of multiple scholarships of teaching were compared alongside articles possessing characteristics of Weimer’s subcategories of SWOTL literature.

3.10.3 Research method selected to possibly answer question 3

Has the landscape studio supported studio educators’ publication of scholarly work on teaching and learning literature?

Articles that qualified as scholarship of teaching articles were sorted using Weimer’s classification scheme for assessing scholarly work on teaching and learning literature authored by faculty in disciplines other than education. The coding criteria identified characteristics of robust pedagogical research known to transcend discipline-specific knowledge. This was done to assure that each article in data set 1 approached the teaching of problem-solving tools, techniques and theories with scholastic rigor that was generalizable, replicable and transferable to other studio-based venues.
3.10.3.1 Coding Criteria used for articles – Data set 1

JOURNAL NAME:
Landscape Journal
Landscape Research
Landscape Review

YEAR:
Identify articles published between 1997 and 2008

CITATION:
Volume
Issue
Pages

AUTHOR’S NAME:
Listed all authors in the order stated in the article

AUTHOR’S GENDER: (not used in final coding)
Female
Male

AUTHOR’S CREDENTIALS: Teaching or research professor (not used in final coding)

TITLE OF ARTICLE:
Listed full title

CLASS: Defined whether an article focused on undergraduate, graduate or general education. Did not include articles on K-12, professional projects or community work.
Undergraduate
Graduate
General education (community-wide)
Other (agriculture extension service)

ACADEMIC DISCIPLINE: This code stood for the disciplinary focus of each article
Landscape architecture
Interdisciplinary
Other

COUNTRY: Country identified the name of the country where the article was published. If there was more than one author, entered a country name for each author.
Australia
Canada
Germany
Japan
New Zealand
United Kingdom
United States
Other

SUBJECT OF THE ARTICLE: Key words or phrases from the abstract and the body of the article where the author(s) addressed landscape studio education, generated problem-solving knowledge, tested a
problem-solving tool or technique, discussed a problem-solving theory, or reported on studio teaching and learning experiences.

CITATION: Recorded the total number of references cited

BIBLIOGRAPHY:
- Discipline-based references
- Interdisciplinary references

MULTIPLE CODERS:
- Coder A
- Coder B
- Coder C

DESCRIPTION OF NON-PEDAGOGICAL RESEARCH METHODS:
- Narrative
- Case Studies
- Methodologies, including architectural research methods described by Groat and Wang
- Advice, results, conclusions
- Related material or advice from outside the primary discipline of landscape architecture
- Curricular / course content issues
- Challenge for the future (referred to author’s stated reason(s) for writing his or her article

KEY WORDS: If the article published keywords, they were copied here. If not, the coder entered keywords related to the subject of the article.
- Teaching
- Learning
- Problem-solving
- Higher Education
- Pedagogy
- Design Process
- Landscape Architecture Studio
- Design Studio
- Interdisciplinary Design
- An open-ended list of problem-solving tools, techniques or theories mentioned by name

ABSTRACT REVIEW – FOCUS OF THE ARTICLE: Recorded the following purposes for each article.
- Is this article posing a new question, a paradigm shift or making a new comment?
- Is this article announcing a new discovery?
- Was this article written in response to a recently published article?
- Are statistical data included? Graphed?
- Has the author published other work on this topic?
- Record the number of times this article has been cited by others.
- How many references were cited?
- Does the author cite references from outside his/her primary discipline, e.g., outside the discipline of landscape architecture?

TOPICS KNOWN TO SUPPORT SWOTL: Identified key words and concepts mentioned by Weimer as having value to SWOTL literature and, or, by journal editors and scholars of landscape architecture as having value to a wider readership of studio educators.
- Problem-solving
- History
Service-learning, applied
Criticism, Evaluation
Research
Creativity
Imagery
Collaborative learning
Pedagogy
Politics
Design Methods
Design Theory
International Design
CAD

TYPE OF SCHOLARSHIP: Identified article as one of three types of SWOTL literature described by Weimer: Wisdom of Practice, Research Scholarship or Promising Possibilities. Sorted article by subcategories using the following table: Weimer’s 2006 classification scheme for assessing scholarly work on teaching and learning literature.
<table>
<thead>
<tr>
<th>Scholarship type for SWOTL literature</th>
<th>Weimer’s subcategories of SWOTL literature and definitions</th>
<th>Qualifying SWOTL articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wisdom of Practice</td>
<td>Personal Accounts of Change: “..., when using this method of analysis, faculty report on experiences associated with implementing an instructional policy, practice, technique, method, or approach. Almost always, the literature reports on the implementation of something different, a change” (Weimer, 2006, p. 40).</td>
<td>Identify articles where design educators reported experiences associated with implementing a change in instructional policy, practice, technique, method, or approach to teaching in the landscape studio.</td>
</tr>
<tr>
<td></td>
<td>Recommended-Practices Reports: “This is advice-giving literature. It recommends what should be done about a single, several, or many aspects of instruction” (Weimer, 2006, p. 41).</td>
<td>Identify articles where design educators offered advice on what should be done about some or several aspects of studio-based instruction.</td>
</tr>
<tr>
<td></td>
<td>Recommended-Content Reports: This type of literature deals with “what the advice is being given about. In these analyses authors propose ways of teaching particular aspects of content; not how they should be taught, but what devices should be used to explain, illustrate, demonstrate, and otherwise support the acquisition of course content” (Weimer, 2006, p. 41).</td>
<td>Identify articles where design educators gave advice pertaining to what devices should be used in the landscape studio to explain, illustrate, demonstrate, or support the acquisition of course content.</td>
</tr>
<tr>
<td></td>
<td>Personal Narratives: “... the method of analysis is generally reflective and critical... authors look inward, relying on their own ideas, insights, and adjustments” (Weimer, 2006, p. 42). This is the oldest form of teaching and learning literature. It typically does not introduce change or give advice.</td>
<td>Identify articles where design educators tell a story of the teaching and learning process or share individual opinions, viewpoints, ideas, concerns, or positions. No references or citations are necessary.</td>
</tr>
<tr>
<td>Research Scholarship</td>
<td>Quantitative Investigations: “Scholarly work using this approach relies on experimental designs that involve treatment and control groups, with some manipulation of variables across or between them” (Weimer, 2006, p. 43).</td>
<td>Identify articles where design educators relied on experimental designs that involved treatment and control groups, with some manipulation of variables across or between them.</td>
</tr>
<tr>
<td></td>
<td>Qualitative Studies: “Qualitative methodologies ... share a commitment to study phenomena in naturalistic settings and to analyze results interpretively” (Weimer, 2006, p. 43).</td>
<td>Identify articles where design educators shared a commitment to study phenomena in naturalistic settings and analyzed results interpretively.</td>
</tr>
</tbody>
</table>
Descriptive Research:  
This type “describes, most commonly by collecting and then analyzing survey data” (Weimer, 2006, p. 43). Analysis can be quantitative or qualitative.

<table>
<thead>
<tr>
<th>Promising Possibilities</th>
<th>Identified articles where design educators collected and analyzed survey data. Analysis may have been quantitative or qualitative. See Hybrids for mixed methods approaches.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrids:</td>
<td>Identify articles where design educators prepared articles that combined two or more of the seven major approaches.</td>
</tr>
<tr>
<td>Innovative:</td>
<td>Identify articles where design educators prepared articles in which the method of analysis was not one of the seven major approaches, but was either something different or an especially creative use of one of the approaches…” (Weimer, 2006, p. 124).</td>
</tr>
<tr>
<td>Unique: Articles:</td>
<td>Identify articles where design educators had prepared scholarly work in which material presented was structured in some unusual way.</td>
</tr>
</tbody>
</table>

Responses to the coding criteria listed above were recorded in a standardized manner. IBM® SPSS® Text Analytics for Surveys was used to code some of the open-ended responses, other responses were coded manually, sorted into categories, and then entered onto an Excel spreadsheet. Words, phrases and sentences from each abstract, key word list and full text article were analyzed. After analyzing the text, the key concepts and word patterns were extracted and classified into categories. Categories were built and fine-tuned to provide a consistent response to linguistic variations in the text.

Later, articles possessing characteristics of multiple scholarships of teaching were compared alongside Weimer’s subcategories of SWOTL literature. These two models of assessing pedagogical research literature were used to identify articles where studio educators in landscape architecture had successfully generated and, or, disseminated pedagogical problem-solving knowledge. This was a significant new way of analyzing articles.

3.10.4 Research method selected to possibly answer question 4

Has the landscape studio supported pedagogical research on problem-solving topics by using practice-based research methods?
The coding criteria used to possibly answer question 4 was embedded in the Coding Criteria used to answer question 3. Practice-based research methods were identified. These were listed under the subheading: description of non-pedagogical research methods. These methods included social science and architectural research methods described by Groat and Wang. These were important non-pedagogical research methods to identify based on the literature review that suggested many interdisciplinary studios use these methods to conduct educational activities.

The category for identifying articles where the educator-author used practice-based research methods was listed under the subheading DESCRIPTION OF NON-PEDAGOGICAL RESEARCH METHODS: Methodologies, including architectural research methods described by Groat and Wang. Seven descriptions of architectural research methods were used to identify and catalog studio educators’ use of non-pedagogical or practice-based research methods when conducting scholarly work on teaching and learning in the landscape studio. This was a necessary category to examine, due to the fact that many studio educators are more familiar with practice-based research method than pedagogical research methods.

Table 8  Non-pedagogical practice-based research methods – Date set 1

<table>
<thead>
<tr>
<th>List Name of Article</th>
<th>Non-pedagogical practice-based research methods</th>
<th>Record the use or mention of non-pedagogical practice-based research methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Study</td>
<td>Logical Argumentation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interpretive Historical</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Qualitative</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correlational</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Experimental</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Simulational</td>
<td></td>
</tr>
</tbody>
</table>

It was important to identify articles that utilized non-pedagogical practice-based research methods. The reason for this was based on Weimer’s findings, which suggested the use of non-pedagogical research methods may result in weak scholarly work on teaching and learning literature. Later, Weimer's SWOTL subcategories for Wisdom of Practice literature and Research Scholarship literature were compared alongside Groat and Wang’s categories of architectural research methods, thereby providing a new way to assess the scholarly rigor of non-pedagogical practice-based research methods.
3.10.5 Research method selected to possibly answer question 5

Has the landscape studio supported research on pedagogically valuable problem-solving tools, techniques or theories?

The coding criteria used to possibly answer question 5 focused on cataloging all problem-solving tools, techniques and, or, theories mentioned in the academic articles. At this point in the sorting process, it was assumed any mention of problem-solving tools, techniques and, or, theories would have educational value and relate in some way to the landscape studio. An open-ended check list was used to make an inventory of all problem-solving tools, techniques or theories mentioned in the fifty-six SWOTL articles in data set 1. Categories included 1) tools together with instruments, means, and devices; 2) techniques together with methods, processes, practices, skills, strategies, plans, approaches, and tactics; and 3) theories together with models, ideas, schemes, and designs.

Table 9 List of tools, techniques and theories by name – Data set 1

<table>
<thead>
<tr>
<th>List Name of Article</th>
<th>List tool, technique or theory by name</th>
<th>Record number of times each tool, technique or theory is mentioned by name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.10.6 Research method selected to possibly answer question 6

What problem-solving tools, techniques or theories did students mention using to discover, explore, or resolve studio-based problems?

A multi-method approach was taken by the researcher to gather data to answer question 6. First, this involved the researcher administering a research questionnaire to all first and final year landscape students, which took students approximately an hour of studio time to complete. Second, this involved one-on-one ‘desk crit’ interviews between the researcher and students who had completed the research questionnaire, which took half an hour for each desk critique-style conversation. Third, this involved the researcher hosting a series of four focus groups, which were scheduled during four different lunch hours to discuss the questionnaire and share further thoughts with students and some of their tutors. Fourth, this involved the researcher observing students at a final project presentation, which required listening as students described how they went about resolving unique problems embedded in their program and site features.
3.10.6.1 The researcher’s argument used to develop research questionnaire – Data set 2

A checklist was developed and used by the researcher to make initial data gathering decisions for the students’ research questionnaire. Refer to Appendix ‘A’ Select Design Journal Articles for a list of resources used by the researcher to develop the research questionnaire. Refer to Appendix ‘B’ Pilot Survey Discussion Questions for a record of questions that were proposed early in the development of the research questionnaire. These questions were discussed with an ad hoc group of graduate students, refined and used in the research questionnaire. Eight graduate students functioned as the researcher’s pilot study participants.

Table 10 Decision-making checklist for the students’ research questionnaire – Data set 2

<table>
<thead>
<tr>
<th>Why use Key Words?</th>
<th>So I could identify ways students solve design studio problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do I accomplish this?</td>
<td>By asking a representative sample of students e.g., a sample size of at least 29 or a census of all students in a smaller class</td>
</tr>
<tr>
<td></td>
<td>By using multiple survey instruments</td>
</tr>
<tr>
<td></td>
<td>By reviewing pedagogical design literature going back ten years</td>
</tr>
<tr>
<td></td>
<td>By reading pedagogical problem-solving literature outside the field of landscape architecture, such as architecture and interior design</td>
</tr>
<tr>
<td>Why compare 1st and 5th year students?</td>
<td>To show range of responses based in experience in the studio over several years</td>
</tr>
<tr>
<td></td>
<td>Use 1st year students’ responses to establish base-line knowledge (also described as novice in the literature)</td>
</tr>
<tr>
<td></td>
<td>Use 5th year students’ responses to establish discipline-based knowledge (also described as expert in the literature)</td>
</tr>
<tr>
<td></td>
<td>Convenience sample – students were available</td>
</tr>
<tr>
<td>Why discuss gender?</td>
<td>To show inclinations that may preference certain students’ design responses</td>
</tr>
<tr>
<td>Why use students from ECA and WSU?</td>
<td>Convenience – in Scotland I have access to 1st and 5th year students in design studios. A second sampling may need to be taken at WSU to meet a goal of having at least 29 students complete the survey in each category.</td>
</tr>
</tbody>
</table>
3.10.6.2 Research questionnaire used to possibly answer question 6 – Data set 2

Research Questionnaire

Student’s coding number: ____________ Class: ____________ Age: _______

Female □ Male □ Are you colour blind? □ Yes □ No

Do you dream in colour? □ Yes □ No

What is your nationality? _____________________________________________

In what countries have you lived? ______________________________________

What is your first language? __________________________________________

In the left-hand column, list all the languages you speak, then check boxes that apply.

<table>
<thead>
<tr>
<th>Language</th>
<th>Speak a few words</th>
<th>Understand general usage</th>
<th>Speak language fluently</th>
<th>Can make a joke</th>
<th>Can read and write</th>
<th>Can problem solve</th>
<th>Can dream in this language</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2.</td>
<td></td>
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<tr>
<td>3.</td>
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<tr>
<td>4.</td>
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<td></td>
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</tr>
<tr>
<td>5.</td>
<td></td>
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</tr>
</tbody>
</table>

Who/what influenced you to become a designer? ________________________________

Explain ________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Please list your favourite hobbies.
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Check the ways you approach designing: □ through tactile knowledge
□ with words □ using numbers □ using logic □ with emotion
□ musically □ using pictures □ in black and white
How do you prefer to communicate your early ideas or concepts?
☐ drawing by hand  ☐ on CAD  ☐ with study models

How do you work out construction details?
☐ drawing by hand  ☐ on CAD  ☐ with study models

When presenting, which method conveys your ideas best?
☐ hand drawings  ☐ CAD  ☐ scaled models

You may be asked to work in a group. Which size group(s) do you feel comfortable presenting your ideas? Circle range below:
No one ⇒ one friend ⇒ tutor ⇒ small group ⇒ large group ⇒ www. ⇒ everyone

Would you prefer to design public places (a sports facility) or private places (a residential garden) and why? __________________________________________
_____________________________________________________________________
_____________________________________________________________________

When starting a new design project, what information do you like to gather first for inspiration?
________________________________________
_____________________________________________________________________
_____________________________________________________________________

Have you ever felt your creativity or imagination has been stifled: If yes, describe:
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Sign your name upside down______________________________________________
Now sign a mirror image of your name______________________________________
Please write your name backwards ___________________________________________

Rank the previous three questions in order of the most difficult to the easiest.
most difficult #_______ medium difficulty #_______ easiest #_________

How many alternative designs do you typically generate for a design project? #_______
At what point in working through a design, do you really ‘see’ the final project?

Is there a point in the design process where you get frustrated? □ Yes □ No
If yes, where in the process? ____________________________

[For example: beginning/middle/completion of…, precedent gathering, site inventory, site analysis, program development, schematic design, conceptual design, group work, meeting with your professor, meeting with the TA, design development, construction drawings, presentations, other.]

Do you use environmentally sustainable solutions in your designs? □ Yes □ No
If yes, describe your focus _____________________________

Check the approaches you prefer to use when solving studio-based problems.
□ Art □ Science □ History □ Culture □ __________

When you doodle, what shape do you start with? Please draw it in the space below

List in order of preference, what media you prefer to use when designing. __________

[For example: models, sketching, CAD, narrative, water colours, site visit, photos, …]

How often do you sketch in your sketchbook? _____________________________

When taking notes in lecture or studio, do you?
□ Remember the discussion in your head?
□ Use a tape recorder?
□ Copy bulleted points from PowerPoint presentation
□ Photograph the white board?
□ Make picture/sketches
□ Use Key Words?
□ Use sentences/narrative?

Do you have a favorite colour? What is it? _____________________________

Would you like to learn about a technique called visual note taking? □ Yes □ No
Briefly, how do you use the following dimensions to solve problems?
Check focus group topics you would be willing to attend as a lunch and learn format.

☐ Aha? or Insight
☐ Originality
☐ Generate New Alternative Ideas
☐ Creative Thinking
☐ Visual-spatial Thinking
☐ Patterns and Reversals

Please give a one word response to the following words:

“Impiration” ____________________________
“Transmogrification” ____________________________
“Humour” _______________________________________
“Design” _______________________________________
“Intuition” _______________________________________

Check areas of strength in which you feel confident when solving studio-based projects:

☐ I have excellent long-term memory
☐ I have excellent short-term memory
☐ I am quick at seeing and solving 3-D puzzles
☐ I am good at using visual images to solve problems
☐ I am good at using numbers to solve problems
☐ I can comfortably hold contradictory ideas in my mind
☐ I can use/produce abstract designs to solve problems
☐ I can use my physical senses (e.g. my fingers know from practical experience)
☐ I think of “things not yet thought of…”
☐ I use language: words, narrative, poetry, Haiku to generate unique concepts
☐ I tell jokes, make witty conversation, generate funny solutions
☐ I design from the ‘heart’: use feelings and intuition
☐ I talk out loud - hearing what I say helps me to think / move forward with ideas
☐ I visualize solutions to problems, even though I may not know where the ideas come from
☐ I see patterns in everything
☐ I think, design, and build through “play”

This pedagogical research study will continue through June 2007 with random studio observation and voluntary focus group discussions. Thank you for your time and cooperation. Elizabeth Payne, postgraduate student in Landscape Architecture. e-mail: elizabeth.payne@eca.ac.uk, Phone: 221-6191.
One-on-one desk crit questions used to possibly answer question 6 – Data set 2

The following list of open-ended questions were used by the researcher at the one-on-one desk crit sessions to inquire about each student’s problem-solving preferences. One-on-one desk crit questions focused on individual student’s process of resolving studio-based projects. Any problem-solving tool, technique or theory a student mentioned having used on their studio project was recorded by the researcher. Each student’s answers were later compared to their responses on the research questionnaire.

<table>
<thead>
<tr>
<th>Researcher’s questions</th>
<th>List students’ answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>What solution generating tools do you prefer when solving design studio problems?</td>
<td></td>
</tr>
<tr>
<td>What motivates you to generate solutions to design studio problems?</td>
<td></td>
</tr>
<tr>
<td>List solution generators you prefer to use when designing.</td>
<td></td>
</tr>
<tr>
<td>What design tools do you use to communicate complex design concepts?</td>
<td></td>
</tr>
<tr>
<td>What design tools do you use to work through complex design studio problems?</td>
<td></td>
</tr>
<tr>
<td>List solution generating tools you prefer when designing.</td>
<td></td>
</tr>
<tr>
<td>Too what do you look for inspiration when problem-solving?</td>
<td></td>
</tr>
<tr>
<td>How many alternatives do you typically generate when working on a design studio problem?</td>
<td></td>
</tr>
<tr>
<td>What design tools do you use to generate initial design concepts?</td>
<td></td>
</tr>
<tr>
<td>What problem-solving tools do you use to work out details?</td>
<td></td>
</tr>
<tr>
<td>What do you feel are your areas of strength or confidence when solving complex problems?</td>
<td></td>
</tr>
<tr>
<td>When first approaching a design studio problem what do you use?</td>
<td></td>
</tr>
</tbody>
</table>

Focus groups used to possibly answer question 6 – Data set 2

The focus group is a common qualitative research method used to test consensus around a single topic. In the case of this study, the focus group was used to test consensus on how important students felt the site visit was to the success of their project.
3.10.6.4.1 Description of the process
Focus group sessions were held within three weeks of administering the research questionnaire. All students who had completed the research questionnaire were invited to attend a focus group. Separate sessions were held for first and final year landscape architecture students. Attendance was not mandatory. Studio tutors were invited to attend. Sessions were held over the lunch hour in a conference room convenient to the landscape studio. There was room for sixteen to twenty participants to be seated around a large table. No props or handouts were used. A brief introduction was made by the researcher concerning the intent of the research. The researcher was the moderator and note taker. To start the conversation, the researcher asked one or two site related questions of the group.

“Do you use computers to draft your site plans?”
“Do you like to visit the site? If so, when in the design process?”

3.10.6.4.2 Tasks required of participants
Students were asked to voice their opinions on how they handled solving a project when it was assigned a real site. Near the end of the hour, the group was asked to come up with a consensus of how important they felt the site visit was in the problem-solving process.

3.10.6.5 Formal Presentation Observation Check List used to possibly answer question 6 – Data set 2
The researcher developed the Formal Presentation Observation Check List as a way of quickly and accurately recording each student’s comments related to how they had gone about solving their studio-based project. The checklist was developed during a pilot session held in Tapestry at ECA. During a formal project presentation, students were asked to present solutions to their studio-based projects to faculty and fellow students. The issues observed at the formal project presentations were similar to those discussed at the one-on-one desk crits and in the focus group sessions. Asking similar questions in different venues allowed the researcher to better understand how each student went about solving his or her unique problem(s). Information from this checklist was triangulated with information from the other three data gathering methods.
### Table 12  Formal Presentation Observation Check List

Formal Presentation Observation Check List

<table>
<thead>
<tr>
<th>Date</th>
<th>______________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td>______________________</td>
</tr>
<tr>
<td>Tutor</td>
<td>______________________</td>
</tr>
<tr>
<td>Term Project</td>
<td>______________________</td>
</tr>
<tr>
<td>Student’s Name</td>
<td>______________________</td>
</tr>
<tr>
<td>Coding Number</td>
<td>______________________</td>
</tr>
</tbody>
</table>

Social Awareness / Team Orientation (used to check student’s expressed frame of reference)

- ‘I’-centered (Example, “I thought it would be a good idea to do such and such.”)
- Group Centered (Example, “We decided to put the object in the center of the design.”)
- Facts / Report (Example, “A report on community gardens showed that 80 % of the…..”)

Problem-solving tools, techniques, or theories –
Tick number of times each ‘key word’ is mentioned during the student’s presentation.

- Logical Progression
- Insight/Intuition
- Innovations
- Design / 2D
- Visual orientation
- Auditory orientation
- Tactile / Model / 3D
- Patterns
- Generate Alternatives Solutions

# How many alternative plans or solutions were shown?
- Site Visit
- Narrative/developed storyline
- Digital Graphics/CAD
- Hold Contradictory Ideas
- Art
- Science
- History
- Culture
- Frustration/Stuckness
4 Data and Data Results

4.1 Data collection and examination
This portion of the chapter presented data gathered from academic articles authored by studio educators (data set 1) and from students of landscape studios (data set 2). Data set 1 was considered a secondary data source. Information was gathered from a census of peer-reviewed articles published between 1997 and 2008 in Landscape Journal, Landscape Research and Landscape Review. Information was gathered to assess each article’s scholarly rigor and to catalog all recommended pedagogical problem-solving tools, techniques, and theories. Data set 2 was considered a primary data source. New information was gathered based on students’ preferred ways of solving studio-based problems. Students’ responses were gathered directly from landscape architecture students at Edinburgh College of Art and Washington State University. Data was collected in 2006 and 2008.

Data set 1 was used to possibly answer research questions 1 through 5. Research questions 1 and 5 dealt with identifying and cataloging the mention of problem-solving tools, techniques, and theories in the academic articles. Questions 2 through 4 dealt with examining the scholarly rigor of the academic articles.

Data set 2 was used to possibly answer research question 6 which cataloged landscape students’ preferred ways of solving studio-based problems.

Research questions 7 and 8 juxtaposed problem-solving approaches recommended by educator-authors in the academic articles (data set 1: question 5) alongside those preferred by landscape architecture students (data set 2: question 6). Research questions 7 and 8 were concerned with whether, or not, students were using problem-solving tools, techniques and theories similar to those recommended by studio educators in the academic articles. Together, data presented in Chapter 4 provided possible answers to the primary research question: How has the landscape studio supported scholarly problem-solving pedagogy?

4.2 Restatement of research questions for data set 1

4.2.1 Question 1
What percentage of articles mentioned the use of problem-solving tools, techniques or theories?
4.2.2 Question 2
What percentage of articles qualified as scholarship of teaching literature?

4.2.3 Question 3
What percentage of articles qualified as scholarly work on teaching and learning literature?

4.2.4 Question 4
Were practice-based methods of research used to generate knowledge on pedagogical problem-solving activities taking place in the landscape studio? If so, what were the practice-based research methods?

4.2.5 Question 5
What problem-solving tools, techniques or theories were specifically mentioned as having educational value in the landscape studio?

4.3 Restatement of research question for data set 2

4.3.1 Question 6
What problem-solving tools, techniques or theories did students mention using to discover, explore, or resolve studio-based problems?

4.4 Restatement of research questions involving both sets of data
The following questions were asked to determine whether students were using educator-recommended, scholastically vetted, problem-solving tools, techniques or theories to solve their studio-based projects.

4.4.1 Question 7
What problem-solving tools, techniques or theories were mentioned in both sets of data?

4.4.2 Question 8
Were gaps evident between the recommended problem-solving tools, techniques or theories mentioned in the educator-authored articles and those used by landscape architecture students? If so, what were the gaps?
4.5 Restatement of research methods for data set 1

4.5.1 1) Neuendorf’s content analysis

Neuendorf’s content analysis was used to determine what percentage of articles mentioned the use of problem-solving tools, techniques or theories in their abstracts, key words or full text.

4.5.2 2) Boyer’s model of scholarship

Boyer’s definitions of four types of scholarship were used to determine what percentage of articles qualified as scholarship of teaching literature. Non-pedagogical research was excluded from further review. Later, Cross and Steadman’s descriptions of multiple scholarships of teaching were used to sort the scholarship of teaching articles into four more narrowly defined categories. Note, the four categories of multiple scholarships of teaching share the same terms as Boyer’s four original types of scholarship: research scholarship, integration, application, and teaching.

4.5.3 3) Weimer’s classification scheme for assessing SWOTL literature

Weimer developed a method for assessing literature authored by faculty in disciplines other than education who were interested in generalizing pedagogical research to a wider audience of educators in practice-based disciplines. Weimer’s method of identifying characteristics of SWOTL literature was used to sort SoT articles. Articles were sorted into Weimer’s three SWOTL categories: Wisdom of Practice, Research Scholarship and Promising Possibilities literature. Qualifying articles were sorted into ten subcategories of SWOTL. These articles were further defined using Cross and Steadman’s four categories of multiple scholarships of teaching.

4.5.4 4) Groat and Wang’s definitions of seven architectural research methods

This method was used to identify common practice-based research approaches used by studio educators to generate pedagogical knowledge based on problem-solving activities taking place in the landscape studio. Articles found to use practice-based research approaches were then compared to articles possessing one of Weimer’s ten subcategories of SWOTL literature.
4.5.5 5) Krippendorff’s open-ended key word protocol
This method was used to identify problem-solving tools, techniques or theories
mentioned by name in the SWOTL articles and described as having educational value
in the landscape studio.

4.6  **Restatement of research methods for data set 2**

4.6.1 6) A multi-method research approach
A multi-method research approach was used to identify problem-solving tools,
techniques or theories used by students to discover, explore or resolve studio-based
problems. Methods for gathering data involved a research questionnaire, one-on-one
interviews between the researcher and individual students, focus groups, and
observations of students’ formal project presentations.

4.7  **Restatement of research methods involving both sets of data**

4.7.1 7) Krippendorff’s open-ended key word protocol
This method was used to search for parities between problem-solving approaches
listed in data set 1 and data set 2.

4.7.2 8) Krippendorff’s open-ended key work protocol
This method was used to search for gaps between problem-solving approaches listed
in data set 1 and data set 2.

4.8  **Data results to answer research question 1**
What percentage of articles mentioned the use of problem-solving tools,
techniques or theories?
4.8.1 Articles on problem-solving topics – reviewed by year

Table 13 Articles on problem-solving topics – reviewed by year

<table>
<thead>
<tr>
<th>Articles by year</th>
<th>Landscape</th>
<th>Landscape</th>
<th>Landscape</th>
<th>Yearly</th>
<th>Total</th>
<th>Percentage of 467 original articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>4</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>2</td>
<td>12</td>
<td></td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>6</td>
<td>5</td>
<td></td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>1</td>
<td>3</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>5</td>
<td>2</td>
<td></td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>7</td>
<td>30</td>
<td></td>
<td>37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>8</td>
<td>1</td>
<td>2</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>5</td>
<td>1</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>3</td>
<td>3</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>2</td>
<td>5</td>
<td></td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>35</td>
<td>25</td>
<td>60</td>
<td>120</td>
<td></td>
<td>26%</td>
</tr>
</tbody>
</table>

Twenty-six percent of the 467 original academic articles published between 1997 and 2008 in data set 1 mentioned problem-solving tools, techniques or theories in their title, abstract or full text.

4.9 Data results to answer research question 2

What percentage of articles qualified as scholarship of teaching literature?

4.9.1 Scholarship of teaching articles

Articles that mentioned problem-solving tools, techniques or theories in their title, abstract or full text were sorted by Boyer’s Model of Scholarship.

Table 14 Scholarship of Teaching articles - defined by Boyer’s Model of Scholarship

<table>
<thead>
<tr>
<th>Journal Titles</th>
<th>Number of articles that qualified as SoT literature</th>
<th>Percentage of 120 articles on problem-solving topics</th>
<th>Percentage of 467 original articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape Journal</td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landscape Research</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landscape Review</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>68</td>
<td>57%</td>
<td>15%</td>
</tr>
</tbody>
</table>

Almost fifteen percent of the original 467 articles, which mentioned problem-solving tools, techniques or theories, qualified as SoT literature. Based on Boyer’s definition of scholarship
of teaching, these SoT articles discussed creative ways teachers build bridges between their own understanding and their students’ learning to solve studio-based problems.

4.9.2 Scholarship of teaching articles – defined by Class

<table>
<thead>
<tr>
<th>Research subjects</th>
<th>Landscape Journal</th>
<th>Landscape Research</th>
<th>Landscape Review</th>
<th>Total research subjects</th>
<th>Percentage of 68 SoT articles</th>
<th>Percentage of 467 original articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate</td>
<td>7</td>
<td>1</td>
<td>6</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Education</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals by journal</td>
<td>12</td>
<td>1</td>
<td>11</td>
<td>24</td>
<td>35%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Almost five percent of the original 467 articles discussed students’ problem-solving pedagogy in the SoT articles. Less than three percent discussed undergraduates’ education. Although this was a very small percentage of articles, we did see some interest in undergraduate education. Twenty-four articles out of the sixty-eight SoT articles acknowledged landscape students as research subjects. Four classes of students were identified. These involved undergraduate students, graduate students or both who participated in studio courses, as well as students who participated in general education experiences. General education experiences were defined as agricultural extension service workshops or community-service projects led by landscape architecture faculty and attended by students of landscape architecture. This data supports the argument by Olsen and Simmons that there is scholarly value in encouraging faculty to conduct undergraduate research. Hill stressed the benefit to students when the studio functions as the primary repository of problem-solving skills toward professional training. When the studio functions in this way, Walker says studio-educators are provided with the opportunity to reinforce the way research and teaching activities come together in the landscape studio. This leads to research like learning. In practice, this might be seen as a general unity of research and teaching. A condition Elton argues is impossible, but one studio educators might hope to see in the future.
4.10 Data results to answer research question 3

What percentage of articles qualified as scholarly work on teaching and learning literature?

Scholarship of Teaching articles were sorted using Weimer’s classification scheme for SWOTL. This sorting process examined multiple areas connected to authors’ scholarly work and the generalizability of teaching in the studio learning environment.

4.10.1 Weimer’s classification scheme for SWOTL – defined by authors

<table>
<thead>
<tr>
<th>Journal Titles</th>
<th>Number of articles authored by studio educators</th>
<th>Percentage of 68 SoT articles</th>
<th>Percentage of 120 problem-solving articles</th>
<th>Percentage of 467 original articles in data set 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape Journal</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landscape Research</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landscape Review</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>56</td>
<td>82%</td>
<td>47%</td>
<td>12%</td>
</tr>
</tbody>
</table>

Twelve percent of the original 467 articles that discussed problem-solving topics and qualified as SoT articles were identified as being authored by studio educators or academic practitioners who were specifically writing for an audience of fellow educators. This cohort of SWOTL articles represented forty-seven percent of the 120 articles that discussed problem-solving topics and eighty-two percent of the SoT articles in data set 1. These findings support Selman’s comment regarding the narrowly defined group of faculty teaching design studios. Findings also support comments made by Cross in 2010. An expansion of scholarly work and design thinking conducted by faculty in the design disciplines is evident in Landscape Journal and Landscape Review. Design faculty make up a small percentage of faculty publishing pedagogical research, but Boyer’s work has made it possible for them to freely discuss undergraduate education, core curriculum, and treat teaching as scholarly work.

Further examination of data set 1 was limited to these fifty-six SWOTL articles. Next, articles were sorted to better understand each author’s professional profile. Note at this point, data sorting was limited to qualifying articles.
4.10.2  Weimer’s classification scheme for SWOTL – defined by country affiliation

Table 17  Weimer’s classification scheme for SWOTL – defined by author’s country affiliation

<table>
<thead>
<tr>
<th>Country associated with author</th>
<th>Landscape Journal</th>
<th>Landscape Research</th>
<th>Landscape Review</th>
<th>Totals by country</th>
<th>Percentage of 56 SWOTL articles</th>
<th>Percentage of 467 original articles in data set 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td>1</td>
<td>3</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>10</td>
<td>5</td>
<td></td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States + Japan</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States + Peru</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States + United Kingdom</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals by journal</td>
<td>12</td>
<td>3</td>
<td>11</td>
<td>26</td>
<td>46%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Author’s country affiliation was stated in twenty-six of the fifty-six SWOTL articles. Authors affiliated with the United States were listed in eighteen of these articles. Six other countries were represented. Fifty-four percent of the articles examined did not provide author’s profiles. Berger, et al., editors of Landscape Review, suggested more diverse discussions will help build pedagogical theory. Toward that end, they have encouraged international scholars to publish their research. While the majority of SWOTL focused on problem-solving topics appeared to be published in the United States, Table 15 did identify collaborations between scholars in the United States and three other countries. In the future we may see more research generated and disseminated by scholars working in countries outside the United States, Canada and the United Kingdom.
4.10.3 Weimer’s classification scheme for SWOTL – defined by author’s stated reason(s) for writing an article

Table 18 Weimer’s classification scheme for SWOTL – defined by author’s stated reason(s) for writing an article

<table>
<thead>
<tr>
<th>Author’s stated reason(s) for writing article</th>
<th>Landscape Journal</th>
<th>Landscape Research</th>
<th>Landscape Review</th>
<th>Total by stated reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Authors’ point of view</td>
<td>6</td>
<td>1</td>
<td>15</td>
<td>22</td>
</tr>
<tr>
<td>2 Transfer findings to reader</td>
<td>5</td>
<td></td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>3 Challenge for the future</td>
<td>7</td>
<td></td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>4 Reporting a paradigm shift</td>
<td>7</td>
<td></td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>5 Condition of funded study</td>
<td>4</td>
<td>1</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>6 Making a significant contribution or announcing a new discovery.</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>7 Responding to another article</td>
<td>2</td>
<td></td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Total number of stated reasons by journal</td>
<td>33</td>
<td>2</td>
<td>49</td>
<td>84</td>
</tr>
</tbody>
</table>

In forty-seven of the fifty-six SWOTL articles, authors reported at least one reason that conformed to Weimer’s list of reasons for publishing SWOTL literature. Some authors stated more than one reason for conducting and publishing their research; this totaled eighty-four reasons. The most frequently mentioned reasons for publishing an article were to convey the author’s point of view or transfer information to the reader. The greatest number of these articles were published in the journal *Landscape Review*. The least mentioned reasons for publishing were to make a new comment, announce something significant or respond to another article. These reasons were considered by Weimer to be the most scholastically robust reasons for publishing SWOTL literature. Findings from Table 16 support arguments by Berger, Corkery and Moore, Gobsert, et al., and Lenzholzer, et al., stating more scholastically robust academic articles must be written on problem-solving topics for synergetic discourse to take place.

4.10.4 Weimer’s classification scheme for assessing SWOTL literature

The following list was based on Weimer’s research on topics known to support SWOTL literature and augmented by journal editors and scholars who were interested in conveying pedagogical problem-solving knowledge beyond the landscape architecture studio.
Table 19  Weimer’s classification scheme for SWOTL – defined by topics that support SWOTL

<table>
<thead>
<tr>
<th>Topics known to support SWOTL</th>
<th>Landscape Journal</th>
<th>Landscape Research</th>
<th>Landscape Review</th>
<th>Total by topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Problem-solving</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>2  History</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>3  Service-learning, applied</td>
<td>3</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4  Criticism, Evaluation</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5  Research</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6  Creativity</td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7  Imagery</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8  Collaborative learning</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9  Pedagogy</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10 Politics</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11 Design Methods</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12 Design Theory</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13 International Design</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14 CAD</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total topics by journal</td>
<td>12</td>
<td>3</td>
<td>11</td>
<td>29</td>
</tr>
</tbody>
</table>

Review of the fifty-six SWOTL articles found evidence that at least one article qualified in each of the fourteen categories known to support SWOTL. A total of twenty-nine mentions were recorded using key word protocol and content analysis. Problem-solving was the only one of the topics known to support SWOTL to appear in all three journals. Problem-solving was mentioned more often than any of the other topics known to support SWOTL literature. The next most reported category as history. Eight categories supported one mention each. It should be noted that these three journals encourage diverse submittals from authors, unlike some of the highly specialized journals described by Powers and Walker, which contribute to the academic rigor of the discipline.

4.10.5  Weimer’s classification scheme for SWOTL: Wisdom of Practice
The following category of SWOTL literature was defined by Weimer as articles that represent the lens of experience.
Wisdom of Practice literature represented nine percent of the 467 original articles in data set 1. Forty-four of the fifty-six SWOTL articles, or seventy-seven percent, qualified as Wisdom of Practice literature. Articles were published in each of the four subcategories of Wisdom of Practice literature: recommended practice reports, personal accounts of change, personal narratives, and recommended content reports.

4.10.6 Weimer’s classification scheme for SWOTL: Research Scholarship

The following category of SWOTL literature was defined by Weimer as articles that represent the lens of objectivity.
Table 21  Weimer’s classification scheme for SWOTL: Research Scholarship literature – defined by articles that represent the lens of objectivity

<table>
<thead>
<tr>
<th>Research Scholarship subcategories</th>
<th>Landscape Journal</th>
<th>Landscape Research</th>
<th>Landscape Review</th>
<th>Frequency of articles that qualified as Research Scholarship</th>
<th>Percentage of 56 SWOTL articles</th>
<th>Percentage of 467 original articles in data set 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualitative Studies</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>11%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantitative Investigation</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Descriptive Research</td>
<td></td>
<td></td>
<td></td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>9</td>
<td>17%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Research scholarship literature represented less than two percent of the 467 original articles in data set 1. Nine of the fifty-six SWOTL articles, or seventeen percent, qualified as research scholarship literature. Articles were published in two subcategories: qualitative studies and quantitative investigation. No articles qualified as descriptive research.

4.10.7  Weimer’s classification scheme for SWOTL: Promising Possibilities

This category of SWOTL literature was defined by Weimer as articles that look to the future.

Table 22  Weimer’s classification scheme for SWOTL: Promising Possibilities literature – defined by articles that look to the future

<table>
<thead>
<tr>
<th>Promising Possibilities subcategories</th>
<th>Landscape Journal</th>
<th>Landscape Research</th>
<th>Landscape Review</th>
<th>Frequency of articles that qualified as Promising Possibilities</th>
<th>Percentage of 56 SWOTL articles</th>
<th>Percentage of 467 original articles in data set 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid approaches to research and publishing</td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Innovative teaching methods</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unique formats</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td></td>
<td>3</td>
<td>6%</td>
<td>1%</td>
<td></td>
</tr>
</tbody>
</table>
Promising Possibilities literature represented less than one percent of the 467 original articles examined in data set 1. Three hybrid approaches to research and publishing were identified amongst the fifty-six SWOTL articles. These articles represented just over five percent of the SWOTL literature in data set 1. No innovative teaching methods or unique formats were identified.

### 4.10.8 Weimer’s classification scheme for SWOTL: Summary

Table 23  Weimer’s classification scheme for SWOTL: Summary – defined by frequency of articles qualifying in SWOTL subcategories

<table>
<thead>
<tr>
<th>Weimer’s SWOTL subcategories</th>
<th>Landscape Journal</th>
<th>Landscape Research</th>
<th>Landscape Review</th>
<th>total number of articles that qualified</th>
<th>Percentage of 56 SWOTL articles</th>
<th>Percentage of 467 original articles in data set 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended Practice Reports</td>
<td>7</td>
<td>6</td>
<td></td>
<td>13</td>
<td>23%</td>
<td></td>
</tr>
<tr>
<td>Personal Accounts of Change</td>
<td>4</td>
<td>8</td>
<td></td>
<td>12</td>
<td>21%</td>
<td></td>
</tr>
<tr>
<td>Personal Narratives</td>
<td>3</td>
<td>8</td>
<td></td>
<td>11</td>
<td>19%</td>
<td></td>
</tr>
<tr>
<td>Recommended Content Reports</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>8</td>
<td>14%</td>
<td></td>
</tr>
<tr>
<td>Qualitative Studies</td>
<td>3</td>
<td>3</td>
<td></td>
<td>6</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>Quantitative Investigation</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Hybrid approaches to research and publishing</td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Descriptive Research</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovative teaching methods</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unique formats</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>26</td>
<td>3</td>
<td>27</td>
<td>56</td>
<td>100%</td>
<td>12%</td>
</tr>
</tbody>
</table>

This table summarized the articles qualifying in SWOTL subcategories by frequency of mention. Fifty-six articles were listed in seven of Weimer’s ten subcategories of SWOTL literature. All four wisdom of practice subcategories were well represented. Two of the three subcategories of research scholarship were represented; these were qualitative studies and quantitative investigation. No articles were found in the subcategory called descriptive research. One category in promising possibilities was represented; this category represented
hybrid approaches to research and publishing. No articles qualified as innovative teaching methods or unique formats. In conclusion, twelve percent of the 467 original articles in data set 1 discussed problem-solving topics, qualified as SoT articles, and possessed characteristics of SWOTL literature.

4.10.9 Discovery type scholarship – defined using Cross and Steadman’s Multiple Scholarships of Teaching

Articles that possessed characteristics of SWOTL literature were sorted by Cross and Steadman’s definitions of Multiple Scholarships of Teaching. This was done to determine whether a relationship existed between the two taxonomies of pedagogical research when applied to data set 1.

Table 24 Discovery type scholarship – defined using Cross and Steadman’s Multiple Scholarships of Teaching

<table>
<thead>
<tr>
<th>Subcategories of SWOTL</th>
<th>Frequency of mention</th>
<th>Percentage of 56 articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualitative Studies</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Quantitative Investigation</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Personal Accounts of Change</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>7</td>
<td>13%</td>
</tr>
</tbody>
</table>

Seven of the fifty-six SWOTL articles qualified as discovery type scholarship when defined using Cross and Steadman’s multiple definitions of Scholarship of Teaching. Seven discovery type articles were identified in three subcategories of SWOTL literature: qualitative studies, quantitative investigation and personal accounts of change. Discovery type MSoT articles represented thirteen percent of the fifty-six SWOTL articles.

4.10.10 Integration type scholarship – defined using Cross and Steadman’s Multiple Scholarships of Teaching

Table 25 Integration type scholarship – defined using Cross and Steadman’s Multiple Scholarships of Teaching

<table>
<thead>
<tr>
<th>Subcategories of SWOTL</th>
<th>Frequency of mention</th>
<th>Percentage of 56 articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended Content Reports</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>9%</td>
</tr>
</tbody>
</table>

Five of the fifty-six SWOTL articles qualified as integration type scholarship when defined using Cross and Steadman’s multiple definitions of Scholarship of Teaching. These articles were identified as recommended content reports, a subcategory of SWOTL articles. Integration type MSoT articles represented nine percent of the fifty-six SWOTL articles.
4.10.11 Application type scholarship – defined using Cross and Steadman’s Multiple Scholarships of Teaching

Table 26 Application type scholarship – defined using Cross and Steadman’s Multiple Scholarships of Teaching

<table>
<thead>
<tr>
<th>Subcategories of SWOTL</th>
<th>Frequency of mention</th>
<th>Percentage of 56 articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended Practice Reports</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>14%</td>
</tr>
</tbody>
</table>

Eight of the fifty-six SWOTL articles qualified as application type scholarship when defined using Cross and Steadman’s multiple definitions of Scholarship of Teaching. These articles were identified as recommended practice reports, a subcategory of SWOTL articles. Application type MSoT articles represented fourteen percent of the fifty-six SWOTL articles.

4.10.12 Teaching Type scholarship: Wisdom of Practice literature – defined using Cross and Steadman’s Multiple Scholarships of Teaching

Table 27 Teaching Type scholarship: Wisdom of Practice literature – defined using Cross and Steadman’s Multiple Scholarships of Teaching

<table>
<thead>
<tr>
<th>Subcategories of SWOTL</th>
<th>Number of articles</th>
<th>Percentage of 56 articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Narratives</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Personal Accounts of Change</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Recommended Practices Reports</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Recommended Content Reports</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>29</td>
<td>52%</td>
</tr>
</tbody>
</table>

Twenty-nine of the fifty-six articles qualified as teaching type scholarship and reported research as Wisdom of Practice literature. Together, personal narratives and personal accounts of change were the most frequently used methods of reporting wisdom of practice knowledge. Less frequently used methods of reporting wisdom of practice knowledge were recommended practices reports and recommended content reports. Wisdom of Practice articles represented fifty-two percent of the fifty-six SWOTL articles and also qualified as MSoT articles.
4.10.13  Teaching Type scholarship: Research Scholarship literature - defined using Cross and Steadman’s Multiple Scholarships of Teaching

Table 28  Teaching Type scholarship: Research Scholarship literature - defined using Cross and Steadman’s Multiple Scholarships of Teaching

<table>
<thead>
<tr>
<th>Subcategories of SWOTL</th>
<th>Frequency of mention</th>
<th>Percentage of 56 articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantitative Investigation</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Qualitative Studies</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Descriptive Research</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>4</td>
<td>7%</td>
</tr>
</tbody>
</table>

Four of the fifty-six SWOTL articles qualified as teaching type scholarship and were reported as research scholarship literature. Three qualitative studies articles and one quantitative investigation article were identified. No articles were found to use descriptive research methods. Research Scholarship articles represented seven percent of the fifty-six SWOTL articles.

4.10.14  Teaching Type scholarship: Promising Possibilities literature – defined using Cross and Steadman’s Multiple Scholarships of Teaching

Table 29  Teaching Type scholarship: Promising Possibilities literature – defined using Cross and Steadman’s Multiple Scholarships of Teaching

<table>
<thead>
<tr>
<th>Subcategories of SWOTL</th>
<th>Number of articles</th>
<th>Percentage of 56 articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid approaches to research and publishing</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Innovative teaching methods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unique formats</td>
<td>3</td>
<td>5%</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Three of the fifty-six SWOTL articles qualified as teaching type scholarship and were reported as promising possibilities literature. Three hybrid articles were identified. No articles were found to use innovative teaching methods or to possess unique formatting methods. Promising possibilities articles represented five percent of the fifty-six SWOTL articles.

In summary, all fifty-six SWOTL articles qualified as one form or another of Multiple Scholarships of Teaching. There appeared to be a relationship between articles possessing characteristics supporting Cross and Steadman’s multiple scholarships of teaching and Weimer’s classification scheme for analyzing the scholarly work of teaching and learning literature. Both taxonomies are based on Boyer’s Models of Scholarship; an assumption
might be made that there would be a relationship between Cross and Steadman’s work and Weimer’s work.

4.11 Data results to answer research question 4

Were practice-based methods of research used to generate knowledge on pedagogical problem-solving activities in the landscape studio? If so, what were the practice-based research methods?

4.11.1 SWOTL articles sorted using Groat & Wang’s methods

Practice-based methods of research used to generate knowledge on pedagogical problem-solving activities in the landscape studio were limited to seven. These seven were based on Groat & Wang’s descriptions of non-pedagogical research methods commonly used in professional design practice, the social sciences, and in higher education. SWOTL articles were examined to determine whether studio educators had used one or more of the seven non-pedagogical research methods when they conducted pedagogical research on problem-solving activities in the landscape studio.

Table 30 SWOTL articles sorted using Groat & Wang’s architectural research methods

<table>
<thead>
<tr>
<th>Weimer’s SWOTL Subcategories</th>
<th>Number of articles per Journal</th>
<th>Groat and Wang’s seven Architectural Research Methods</th>
<th>Number of articles per Journal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Account of Change</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Recommended Practice Report</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Recommended Content Report</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Personal Narrative</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Quantitative</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Qualitative</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Totals by Journal</td>
<td>12</td>
<td>1</td>
<td>10</td>
</tr>
</tbody>
</table>

Twenty-three articles out of the fifty-six SWOTL articles used one of Groat and Wang’s architectural research methods for describing pedagogical activities in the landscape studio. Case studies was the most frequently used architectural research method. It was used by authors in ten articles. Five articles apiece were published in Landscape Journal and in
Landscape Review. Logical argumentation and survey methods were moderately used. Logical argumentation appeared in five articles. It was used by one or more authors in each of the three journals. Survey method was favored by authors in five articles published in Landscape Journal and Landscape Review. Literature review was used in two articles, once in Landscape Journal and once in Landscape Review. The least frequently used mentioned architectural research method was document research. It was used in one Landscape Journal article. No use of experimental or simulation research methods were found during the examination of the fifty-six SWOTL articles. This data supported the quote attributed to Schön by Johnansson that described the case study as having special importance in the building of a professional repertoire, in addition to having value as a meta-method within the architectural research strategies described by Groat and Wang.

4.12 Data results to answer research question 5

What problem-solving tools, techniques or theories were specifically mentioned as having educational value in the landscape studio?

4.12.1 SWOTL articles sorted by mention of problem-solving tools, techniques and, or, theories

Table 31 SWOTL articles sorted by mentions of problem-solving tools, techniques and theories

<table>
<thead>
<tr>
<th></th>
<th>A list of problem-solving tools, techniques and theories specifically identified in the SWOTL articles as having educational value</th>
<th>Number of SWOTL articles in which a specific problem-solving tool, technique or theory was mentioned</th>
<th>Percentage of 56 SWOTL articles in which a problem-solving tool, technique or theory was mentioned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Team Work</td>
<td>22</td>
<td>10%</td>
</tr>
<tr>
<td>2.</td>
<td>Culture</td>
<td>21</td>
<td>10%</td>
</tr>
<tr>
<td>3.</td>
<td>Environment</td>
<td>18</td>
<td>8%</td>
</tr>
<tr>
<td>4.</td>
<td>Site Visit</td>
<td>16</td>
<td>7%</td>
</tr>
<tr>
<td>5.</td>
<td>Innovation</td>
<td>16</td>
<td>7%</td>
</tr>
<tr>
<td>6.</td>
<td>Hold Contradictory Ideas</td>
<td>14</td>
<td>6%</td>
</tr>
<tr>
<td>7.</td>
<td>Intuition</td>
<td>12</td>
<td>5%</td>
</tr>
<tr>
<td>8.</td>
<td>History</td>
<td>11</td>
<td>5%</td>
</tr>
<tr>
<td>9.</td>
<td>Narrative</td>
<td>11</td>
<td>5%</td>
</tr>
<tr>
<td>10.</td>
<td>Talk</td>
<td>10</td>
<td>5%</td>
</tr>
<tr>
<td>11.</td>
<td>Pattern</td>
<td>9</td>
<td>5%</td>
</tr>
<tr>
<td>12.</td>
<td>4D</td>
<td>8</td>
<td>4%</td>
</tr>
<tr>
<td>13.</td>
<td>Science</td>
<td>7</td>
<td>3%</td>
</tr>
<tr>
<td>14.</td>
<td>Art</td>
<td>7</td>
<td>3%</td>
</tr>
<tr>
<td>15.</td>
<td>Models</td>
<td>7</td>
<td>3%</td>
</tr>
<tr>
<td>16.</td>
<td>2D</td>
<td>6</td>
<td>3%</td>
</tr>
<tr>
<td>17.</td>
<td>Alternatives</td>
<td>5</td>
<td>2%</td>
</tr>
</tbody>
</table>
Examination of the fifty-six SWOTL articles found twenty-two different problem-solving tools, techniques or theories were mentioned as having educational value in the landscape studio. Most educator-authors discussed more than one pedagogical problem-solving tool, technique or theory, or about four problem-solving methods per article. This may indicate the use of multiple ways of teaching and learning problem-solving. This resulted in 219 separate discussions of problem-solving tools, techniques and theories in the fifty-six articles.

This table listed tools, techniques and theories from the most frequently mentioned to the least frequently mentioned. Team work and culture were mentioned in ten percent of the articles. The environment, site visits, and innovation ranked just behind team work and culture. The ability to hold contradictory ideas or to use intuition was discussed in five to six percent of the articles. Interdisciplinary methods of solving problems involving history, science, art, and drawing were mentioned in three to five percent of the articles. Tools, techniques and theories mentioned in less than two percent of the articles included generating alternative solutions, analyzing movement, music, or dance, using visual images, generating 3-D computer aided drawings, focusing on play and applying logic to a solution.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>18.</td>
<td>Movement/Music/Dance</td>
<td>5</td>
<td>2%</td>
</tr>
<tr>
<td>19.</td>
<td>Visual Images</td>
<td>5</td>
<td>2%</td>
</tr>
<tr>
<td>20.</td>
<td>3-D</td>
<td>4</td>
<td>2%</td>
</tr>
<tr>
<td>21.</td>
<td>Play</td>
<td>3</td>
<td>1%</td>
</tr>
<tr>
<td>22.</td>
<td>Logic</td>
<td>2</td>
<td>1%</td>
</tr>
<tr>
<td>Total</td>
<td>219</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
4.13 Data results to answer research question 6

What problem-solving tools, techniques or theories did students mention using to discover, explore, or resolve studio-based problems?

4.13.1 Landscape architecture student participants

The following data comes from the research questionnaires completed by first and final year students at ECA and WSU. This data was substantiated by qualitative data gathered through subsequent research instruments: one-on-one interviews, focus groups and the observation of students’ formal project presentations.

Table 32 Landscape architecture student participants

<table>
<thead>
<tr>
<th>Class Rank</th>
<th>Gender</th>
<th>School</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>First year</td>
<td>Female</td>
<td>WSU</td>
<td>9</td>
</tr>
<tr>
<td>First year</td>
<td>Female</td>
<td>ECA</td>
<td>11</td>
</tr>
<tr>
<td>First year</td>
<td>Male</td>
<td>WSU</td>
<td>12</td>
</tr>
<tr>
<td>First year</td>
<td>Male</td>
<td>ECA</td>
<td>10</td>
</tr>
<tr>
<td>Final year</td>
<td>Female</td>
<td>WSU</td>
<td>8</td>
</tr>
<tr>
<td>Final year</td>
<td>Female</td>
<td>ECA</td>
<td>6</td>
</tr>
<tr>
<td>Final year</td>
<td>Male</td>
<td>WSU</td>
<td>10</td>
</tr>
<tr>
<td>Final year</td>
<td>Male</td>
<td>ECA</td>
<td>12</td>
</tr>
<tr>
<td>Total students</td>
<td></td>
<td></td>
<td>78</td>
</tr>
</tbody>
</table>

The following table showed that seventy-eight landscape students participated in the multi-method studio-based survey. Participants included forty-four males and thirty-four females. Thirty-nine Edinburgh College of Art students and thirty-nine Washington State University students participated. Forty-two were first year students and thirty-six were final year students.
4.13.2 Students’ responses to problem-solving preferences – by Females

Table 33 Students’ responses to problem-solving preferences – by Females

<table>
<thead>
<tr>
<th></th>
<th>Tool, technique, or theory</th>
<th>Number of female students reporting preferences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Visual Images</td>
<td>33</td>
</tr>
<tr>
<td>2.</td>
<td>2-5 Alternatives</td>
<td>28</td>
</tr>
<tr>
<td>3.</td>
<td>Site Visit</td>
<td>20</td>
</tr>
<tr>
<td>4.</td>
<td>Art</td>
<td>20</td>
</tr>
<tr>
<td>5.</td>
<td>Science</td>
<td>19</td>
</tr>
<tr>
<td>6.</td>
<td>CAD</td>
<td>18</td>
</tr>
<tr>
<td>7.</td>
<td>Play</td>
<td>18</td>
</tr>
<tr>
<td>8.</td>
<td>2D B/W Sketching</td>
<td>18</td>
</tr>
<tr>
<td>9.</td>
<td>Talk</td>
<td>17</td>
</tr>
<tr>
<td>10.</td>
<td>4D Dreaming</td>
<td>17</td>
</tr>
<tr>
<td>11.</td>
<td>Hold Contradictory Ideas</td>
<td>16</td>
</tr>
<tr>
<td>12.</td>
<td>Intuition</td>
<td>14</td>
</tr>
<tr>
<td>13.</td>
<td>History</td>
<td>13</td>
</tr>
<tr>
<td>14.</td>
<td>Culture</td>
<td>13</td>
</tr>
<tr>
<td>15.</td>
<td>Schön’s design process</td>
<td>12</td>
</tr>
<tr>
<td>16.</td>
<td>4D Aha! Moment</td>
<td>11</td>
</tr>
<tr>
<td>17.</td>
<td>Narrative</td>
<td>11</td>
</tr>
<tr>
<td>18.</td>
<td>3D puzzles</td>
<td>10</td>
</tr>
<tr>
<td>19.</td>
<td>2D color rendering</td>
<td>8</td>
</tr>
<tr>
<td>20.</td>
<td>3D scaled Model</td>
<td>8</td>
</tr>
<tr>
<td>21.</td>
<td>2D drafting</td>
<td>8</td>
</tr>
<tr>
<td>22.</td>
<td>Patterns</td>
<td>7</td>
</tr>
<tr>
<td>23.</td>
<td>Markettes</td>
<td>6</td>
</tr>
<tr>
<td>24.</td>
<td>Movement/Music/Dance</td>
<td>6</td>
</tr>
<tr>
<td>25.</td>
<td>4D space/time</td>
<td>6</td>
</tr>
<tr>
<td>26.</td>
<td>Environment</td>
<td>5</td>
</tr>
<tr>
<td>27.</td>
<td>Theory</td>
<td>5</td>
</tr>
<tr>
<td>28.</td>
<td>Logic</td>
<td>4</td>
</tr>
<tr>
<td>29.</td>
<td>One Alternative</td>
<td>3</td>
</tr>
<tr>
<td>30.</td>
<td>6-10 Alternatives</td>
<td>2</td>
</tr>
<tr>
<td>31.</td>
<td>Over 10 Alternatives</td>
<td>1</td>
</tr>
</tbody>
</table>

Female students reported thirty-one ways that they preferred to discover, explore, or resolve studio-based problems. Female students reported they preferred to use visual images and to generate between two and five alternative solutions. High on their list of problem-solving approaches were site visits, art, and science. Preferred technical skills included CAD, play and sketching. These ranked along with talk, dreaming and holding contradictory ideas. Least used approaches by female students were theory and logic.
Table 34: Students’ responses to problem-solving preferences – by Males

<table>
<thead>
<tr>
<th>Tool, technique, or theory</th>
<th>Number of male students reporting preferences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Visual Images</td>
<td>39</td>
</tr>
<tr>
<td>2. 2-5 Alternatives</td>
<td>38</td>
</tr>
<tr>
<td>3. Hold Contradictory Ideas</td>
<td>34</td>
</tr>
<tr>
<td>4. Play</td>
<td>33</td>
</tr>
<tr>
<td>5. Science</td>
<td>30</td>
</tr>
<tr>
<td>6. 2D B/W Sketching</td>
<td>27</td>
</tr>
<tr>
<td>7. Art</td>
<td>27</td>
</tr>
<tr>
<td>8. CAD</td>
<td>25</td>
</tr>
<tr>
<td>9. 4D Dreaming</td>
<td>25</td>
</tr>
<tr>
<td>10. Site Visit</td>
<td>25</td>
</tr>
<tr>
<td>11. History</td>
<td>23</td>
</tr>
<tr>
<td>12. Patterns</td>
<td>22</td>
</tr>
<tr>
<td>13. Intuition</td>
<td>21</td>
</tr>
<tr>
<td>14. 3D scaled Model</td>
<td>21</td>
</tr>
<tr>
<td>15. Culture</td>
<td>21</td>
</tr>
<tr>
<td>16. Narrative</td>
<td>20</td>
</tr>
<tr>
<td>17. 3D puzzles</td>
<td>14</td>
</tr>
<tr>
<td>18. Schön’s design process</td>
<td>14</td>
</tr>
<tr>
<td>19. 4D space/time</td>
<td>12</td>
</tr>
<tr>
<td>20. Logic</td>
<td>12</td>
</tr>
<tr>
<td>21. 2D drafting</td>
<td>11</td>
</tr>
<tr>
<td>22. Talk</td>
<td>9</td>
</tr>
<tr>
<td>23. Theory</td>
<td>9</td>
</tr>
<tr>
<td>24. Environment</td>
<td>8</td>
</tr>
<tr>
<td>25. Movement/Music/Dance</td>
<td>8</td>
</tr>
<tr>
<td>26. 4D Aha! Moment</td>
<td>7</td>
</tr>
<tr>
<td>27. 2D color rendering</td>
<td>6</td>
</tr>
<tr>
<td>28. Markettes</td>
<td>5</td>
</tr>
<tr>
<td>29. One Alternative</td>
<td>4</td>
</tr>
<tr>
<td>30. Over 10 Alternatives</td>
<td>1</td>
</tr>
<tr>
<td>31. 6-10 Alternatives</td>
<td>1</td>
</tr>
</tbody>
</table>

Male students reported thirty-one ways that they preferred to discover, explore, or resolve studio-based problems. Male students, like the female students, reported that they preferred to use visual images and generate between two and five alternative solutions. They also reported that they solved problems by holding contradictory ideas, playing and using science. Their least often used approaches were drawing and constructing markettes.
### Summary of students’ problem-solving preferences – by Gender

#### Table 35: Summary of students’ problem-solving preferences – by Gender

<table>
<thead>
<tr>
<th>Tool, technique, or theory</th>
<th>Female students</th>
<th>Male students</th>
<th>Percentage difference in response rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>Talk</td>
<td>17</td>
<td>50.0%</td>
<td>9</td>
</tr>
<tr>
<td>4D Aha! Moment</td>
<td>11</td>
<td>32.4%</td>
<td>7</td>
</tr>
<tr>
<td>2D color rendering</td>
<td>8</td>
<td>23.5%</td>
<td>6</td>
</tr>
<tr>
<td>Visual Images</td>
<td>33</td>
<td>97.1%</td>
<td>39</td>
</tr>
<tr>
<td>Markettes</td>
<td>6</td>
<td>17.6%</td>
<td>5</td>
</tr>
<tr>
<td>6-10 Alternatives</td>
<td>2</td>
<td>5.9%</td>
<td>1</td>
</tr>
<tr>
<td>Schön’s design process</td>
<td>12</td>
<td>35.3%</td>
<td>14</td>
</tr>
<tr>
<td>Site Visit</td>
<td>20</td>
<td>58.8%</td>
<td>25</td>
</tr>
<tr>
<td>Over 10 Alternatives</td>
<td>1</td>
<td>2.9%</td>
<td>1</td>
</tr>
<tr>
<td>One Alternative</td>
<td>3</td>
<td>8.8%</td>
<td>4</td>
</tr>
<tr>
<td>Movement/Music/Dance</td>
<td>6</td>
<td>17.6%</td>
<td>8</td>
</tr>
<tr>
<td>2D drafting</td>
<td>8</td>
<td>23.5%</td>
<td>11</td>
</tr>
<tr>
<td>3D puzzles</td>
<td>10</td>
<td>29.4%</td>
<td>14</td>
</tr>
<tr>
<td>Environment</td>
<td>5</td>
<td>14.7%</td>
<td>8</td>
</tr>
<tr>
<td>Art</td>
<td>20</td>
<td>58.8%</td>
<td>27</td>
</tr>
<tr>
<td>2-5 Alternatives</td>
<td>28</td>
<td>82.4%</td>
<td>38</td>
</tr>
<tr>
<td>CAD</td>
<td>18</td>
<td>52.9%</td>
<td>25</td>
</tr>
<tr>
<td>Theory</td>
<td>5</td>
<td>14.7%</td>
<td>9</td>
</tr>
<tr>
<td>4D Dreaming</td>
<td>17</td>
<td>50.0%</td>
<td>25</td>
</tr>
<tr>
<td>Intuition</td>
<td>14</td>
<td>41.2%</td>
<td>21</td>
</tr>
<tr>
<td>2D B/W Sketching</td>
<td>18</td>
<td>52.9%</td>
<td>27</td>
</tr>
<tr>
<td>Culture</td>
<td>13</td>
<td>38.2%</td>
<td>21</td>
</tr>
<tr>
<td>4D space/time</td>
<td>6</td>
<td>17.6%</td>
<td>12</td>
</tr>
<tr>
<td>Science</td>
<td>19</td>
<td>55.9%</td>
<td>30</td>
</tr>
<tr>
<td>Narrative</td>
<td>11</td>
<td>32.4%</td>
<td>20</td>
</tr>
<tr>
<td>History</td>
<td>13</td>
<td>38.2%</td>
<td>23</td>
</tr>
<tr>
<td>Logic</td>
<td>4</td>
<td>11.8%</td>
<td>12</td>
</tr>
<tr>
<td>Play</td>
<td>18</td>
<td>52.9%</td>
<td>33</td>
</tr>
<tr>
<td>3D scaled Model</td>
<td>8</td>
<td>23.5%</td>
<td>21</td>
</tr>
<tr>
<td>Patterns</td>
<td>7</td>
<td>20.6%</td>
<td>22</td>
</tr>
<tr>
<td>Hold Contradictory Ideas</td>
<td>16</td>
<td>47.1%</td>
<td>34</td>
</tr>
</tbody>
</table>

Positive percentage difference in response rates indicated that females reported using a particular approach more often than males. A negative percentage indicated that males reported using a particular approach more often than females. This table showed that there was some difference in response rates between males and females. Females preferred talk and reported aha moments, while males preferred to hold contradictory ideas, look for patterns, build models and play. Moore favored intuition when training in the landscape studio. Intuition was favored by males 7% more than by females.
Less than a ten percent difference in response rates was found between genders in nineteen of the thirty-one problem-solving preferences.

4.13.5 Summary of students’ problem-solving preferences – by School

Table 36 Summary of students’ problem-solving preferences – by School

<table>
<thead>
<tr>
<th>Tool, technique, or theory</th>
<th>WSU</th>
<th>ECA</th>
<th>Percentage difference in response rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>2D B/W Sketching</td>
<td>28</td>
<td>71.8%</td>
<td>17</td>
</tr>
<tr>
<td>Art</td>
<td>27</td>
<td>69.2%</td>
<td>20</td>
</tr>
<tr>
<td>Schön’s design process</td>
<td>16</td>
<td>41.0%</td>
<td>10</td>
</tr>
<tr>
<td>Site Visit</td>
<td>25</td>
<td>64.1%</td>
<td>20</td>
</tr>
<tr>
<td>Culture</td>
<td>19</td>
<td>48.7%</td>
<td>15</td>
</tr>
<tr>
<td>Talk</td>
<td>14</td>
<td>35.9%</td>
<td>12</td>
</tr>
<tr>
<td>Visual Images</td>
<td>37</td>
<td>94.9%</td>
<td>35</td>
</tr>
<tr>
<td>4D Dreaming</td>
<td>22</td>
<td>56.4%</td>
<td>20</td>
</tr>
<tr>
<td>Over 10 Alternatives</td>
<td>2</td>
<td>5.1%</td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>25</td>
<td>64.1%</td>
<td>24</td>
</tr>
<tr>
<td>Markettes</td>
<td>6</td>
<td>15.4%</td>
<td>5</td>
</tr>
<tr>
<td>One Alternative</td>
<td>4</td>
<td>10.3%</td>
<td>3</td>
</tr>
<tr>
<td>3D puzzles</td>
<td>12</td>
<td>30.8%</td>
<td>12</td>
</tr>
<tr>
<td>History</td>
<td>18</td>
<td>46.2%</td>
<td>18</td>
</tr>
<tr>
<td>4D Space/time</td>
<td>9</td>
<td>23.1%</td>
<td>9</td>
</tr>
<tr>
<td>Environment</td>
<td>6</td>
<td>15.4%</td>
<td>7</td>
</tr>
<tr>
<td>CAD</td>
<td>21</td>
<td>53.8%</td>
<td>22</td>
</tr>
<tr>
<td>6 -10 Alternatives</td>
<td>1</td>
<td>2.6%</td>
<td>2</td>
</tr>
<tr>
<td>Play</td>
<td>25</td>
<td>64.1%</td>
<td>26</td>
</tr>
<tr>
<td>Movement/Music/Dance</td>
<td>6</td>
<td>15.4%</td>
<td>8</td>
</tr>
<tr>
<td>4D Aha! Moment</td>
<td>8</td>
<td>20.5%</td>
<td>10</td>
</tr>
<tr>
<td>2-5 Alternatives</td>
<td>32</td>
<td>82.1%</td>
<td>34</td>
</tr>
<tr>
<td>Patterns</td>
<td>13</td>
<td>33.3%</td>
<td>16</td>
</tr>
<tr>
<td>Narrative</td>
<td>14</td>
<td>35.9%</td>
<td>17</td>
</tr>
<tr>
<td>Intuition</td>
<td>16</td>
<td>41.0%</td>
<td>19</td>
</tr>
<tr>
<td>Hold Contradictory Ideas</td>
<td>23</td>
<td>59.0%</td>
<td>27</td>
</tr>
<tr>
<td>2D-photos</td>
<td>7</td>
<td>17.9%</td>
<td>12</td>
</tr>
<tr>
<td>2D drafting</td>
<td>4</td>
<td>10.3%</td>
<td>10</td>
</tr>
<tr>
<td>Logic</td>
<td>4</td>
<td>10.3%</td>
<td>12</td>
</tr>
<tr>
<td>Theory</td>
<td>3</td>
<td>7.7%</td>
<td>11</td>
</tr>
<tr>
<td>3D Scaled Models</td>
<td>8</td>
<td>20.5%</td>
<td>21</td>
</tr>
</tbody>
</table>

Positive percentage difference in response rates indicated that students at WSU used a particular approach more often than students at ECA. A negative percentage indicated that ECA students used a particular approach more often than WSU students. Students at WSU reported they preferred to use visual images, two to five alternatives, sketching, and art. They valued site visits, used science, and played, in addition they held contradictory ideas.
dreamed, and used CAD. WSU students’ least preferred approach to problem-solving, aside from generating less than two or more than five alternative solutions, was using theory.

Students at ECA also preferred to use visual images. Their responses were quite similar to their counterparts at WSU, except in their use of scaled models to solve problems. Their least used approach was also the same as WSU students e.g., generating less than two or more than five alternative solutions. Students from both schools shared twenty categories of problem-solving approaches having less than a ten percent difference in response rates; interesting results, in that students were working on two continents. Findings in Table 36 supported the researcher’s assumption that studio pedagogy would be similar between the two schools, even though they were based on different academic systems.
Table 37 Summary of students’ problem-solving preferences – by first year and final year

<table>
<thead>
<tr>
<th>Preferred approaches to solving problems</th>
<th>First Year Students</th>
<th>Final Year Students</th>
<th>Percentage difference in response rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>4D Dreaming</td>
<td>33</td>
<td>78.6%</td>
<td>9</td>
</tr>
<tr>
<td>Art</td>
<td>30</td>
<td>71.4%</td>
<td>17</td>
</tr>
<tr>
<td>3D puzzles</td>
<td>16</td>
<td>38.1%</td>
<td>8</td>
</tr>
<tr>
<td>Play</td>
<td>29</td>
<td>69.0%</td>
<td>22</td>
</tr>
<tr>
<td>Movement/Music/Dance</td>
<td>9</td>
<td>21.4%</td>
<td>5</td>
</tr>
<tr>
<td>Alternatives, 2 to 5</td>
<td>37</td>
<td>88.1%</td>
<td>29</td>
</tr>
<tr>
<td>Visual Images</td>
<td>40</td>
<td>95.2%</td>
<td>32</td>
</tr>
<tr>
<td>Schöns design process</td>
<td>15</td>
<td>35.7%</td>
<td>11</td>
</tr>
<tr>
<td>2D B/W Sketching</td>
<td>25</td>
<td>59.5%</td>
<td>20</td>
</tr>
<tr>
<td>Logic</td>
<td>9</td>
<td>21.4%</td>
<td>7</td>
</tr>
<tr>
<td>Alternatives, 6 to 10</td>
<td>2</td>
<td>4.8%</td>
<td>1</td>
</tr>
<tr>
<td>Talk Protocol</td>
<td>14</td>
<td>33.3%</td>
<td>12</td>
</tr>
<tr>
<td>Hold Contradictory Ideas</td>
<td>27</td>
<td>64.3%</td>
<td>23</td>
</tr>
<tr>
<td>Markettes</td>
<td>6</td>
<td>14.3%</td>
<td>5</td>
</tr>
<tr>
<td>Site Visit</td>
<td>24</td>
<td>57.1%</td>
<td>21</td>
</tr>
<tr>
<td>2D hand drafting</td>
<td>10</td>
<td>23.8%</td>
<td>9</td>
</tr>
<tr>
<td>2D color rendering</td>
<td>7</td>
<td>16.7%</td>
<td>7</td>
</tr>
<tr>
<td>Alternative, 1 only</td>
<td>3</td>
<td>7.1%</td>
<td>4</td>
</tr>
<tr>
<td>Alternatives, over 10</td>
<td>0</td>
<td>0.0%</td>
<td>2</td>
</tr>
<tr>
<td>Theory</td>
<td>6</td>
<td>14.3%</td>
<td>8</td>
</tr>
<tr>
<td>Intuition</td>
<td>17</td>
<td>40.5%</td>
<td>18</td>
</tr>
<tr>
<td>3D scaled Model</td>
<td>13</td>
<td>31.0%</td>
<td>16</td>
</tr>
<tr>
<td>CAD</td>
<td>20</td>
<td>47.6%</td>
<td>23</td>
</tr>
<tr>
<td>Culture</td>
<td>15</td>
<td>35.7%</td>
<td>19</td>
</tr>
<tr>
<td>4D Aha! moment</td>
<td>6</td>
<td>14.3%</td>
<td>12</td>
</tr>
<tr>
<td>Environment</td>
<td>3</td>
<td>7.1%</td>
<td>10</td>
</tr>
<tr>
<td>Narrative</td>
<td>12</td>
<td>28.6%</td>
<td>19</td>
</tr>
<tr>
<td>Patterns</td>
<td>10</td>
<td>23.8%</td>
<td>19</td>
</tr>
<tr>
<td>Science</td>
<td>20</td>
<td>47.6%</td>
<td>29</td>
</tr>
<tr>
<td>History</td>
<td>13</td>
<td>31.0%</td>
<td>23</td>
</tr>
<tr>
<td>4D space/time</td>
<td>3</td>
<td>7.1%</td>
<td>15</td>
</tr>
</tbody>
</table>

Positive percentage difference in response rates indicated that first year students used a particular approach more often than final year students. A negative percentage indicated that final year students used a particular approach more often than first year students. Many approaches were found to be similar between the first and final year of studio, however, differences did appear. Dreaming, art and the use of puzzles were preferred by first year students. An increased awareness of history, science, and four-dimensional space/time were
reported by final year students. Students from first and final years shared seventeen categories of problem-solving approaches having less than a ten percent difference in response rates.

To summarize, there were many shared categories of problem-solving approaches: 19 by gender, 20 by schools, and 17 by class year. The greatest difference was between first and final year students regardless of gender or school. Of the three, difference by class showed students were learning new or different problem-solving approaches. Findings in Table 37 suggested that educators play an important role in introducing problem-solving methods to students. The researcher plans to teach problem-solving tools, techniques and theories with more authority and continue to conduct pedagogical research to determine the best delivery methods for the studio environment.

4.13.7 Teamwork – preferred group size by percentage and number
Students were asked in which size group they felt comfortable presenting their ideas.

Table 38 Teamwork – preferred group size by percentage

<table>
<thead>
<tr>
<th>Participants by year, gender and school</th>
<th>The student preferred to work...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1) with no one else 2) with one friend 3) with tutor 4) in small group 5) in large group 6) using the web 7) with everyone</td>
</tr>
<tr>
<td>LA1F (WSU) Counts</td>
<td>8 1 0 0 0 0 0</td>
</tr>
<tr>
<td>LA1F (WSU) %</td>
<td>89% 11% 0% 0% 0% 0% 0%</td>
</tr>
<tr>
<td>LA1F (ECA) Counts</td>
<td>3 0 0 0 7 0 0</td>
</tr>
<tr>
<td>LA1F (ECA) %</td>
<td>27% 0% 0% 0% 64% 0% 0%</td>
</tr>
<tr>
<td>LA1M (WSU) Counts</td>
<td>7 2 2 0 1 0 0</td>
</tr>
<tr>
<td>LA1M (WSU) %</td>
<td>58% 17% 17% 0% 8% 0% 0%</td>
</tr>
<tr>
<td>LA1M (ECA) Counts</td>
<td>2 2 3 2 0 1 0</td>
</tr>
<tr>
<td>LA1M (ECA) %</td>
<td>20% 20% 30% 20% 0% 10% 0%</td>
</tr>
<tr>
<td>LA5F (WSU) Counts</td>
<td>4 0 1 1 0 0 2</td>
</tr>
<tr>
<td>LA5F (WSU) %</td>
<td>50% 0% 13% 13% 0% 0% 25%</td>
</tr>
<tr>
<td>LA5F (ECA) Counts</td>
<td>3 0 1 1 0 0 1</td>
</tr>
<tr>
<td>LA5F (ECA) %</td>
<td>50% 0% 17% 17% 0% 0% 17%</td>
</tr>
<tr>
<td>LA5M (WSU) Counts</td>
<td>5 1 0 0 1 3</td>
</tr>
<tr>
<td>LA5M (WSU) %</td>
<td>50% 10% 0% 0% 0% 10% 30%</td>
</tr>
<tr>
<td>LA5M (ECA) Counts</td>
<td>6 1 1 1 0 1 2</td>
</tr>
<tr>
<td>LA5M (ECA) %</td>
<td>50% 8% 8% 8% 0% 8% 17%</td>
</tr>
</tbody>
</table>

Seventy-seven out of the seventy-eight students described the size of group in which they preferred to work. Students’ view of working in groups varied by class (first or final year), gender (male or female), and school (WSU or ECA). Data was discussed in detail in the
following tables. The most concentrated opinions were held by first year females at WSU who reported preferring to work with no one else. The most versatile group were final year males at ECA. Schön spent much of his time as an observer exploring why people acted as they did in groups. This is an area requiring further research.

4.13.8 Teamwork – preferred group size by gender: male or female

Table 39: Group Size Preference by Gender: male or female

<table>
<thead>
<tr>
<th>#</th>
<th>Group size preference</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Student preferred to work with no one else</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>Student preferred to work with one friend</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Student preferred to work with tutor</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Student preferred to work in small group</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Student preferred to work in large group</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>Student preferred to use the web</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Student was comfortable working with everyone</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total number of responses by gender</td>
<td>47</td>
<td>33</td>
</tr>
</tbody>
</table>

Multiple responses were allowed on this question. Forty-four males responded to this question. Three males gave two answers apiece. Thirty-three females reported one preference for working in a group. The majority of students preferred to work with no one else. Males appeared more willing to work with a friend, a studio tutor or everyone than did the females.

4.13.9 Teamwork – preferred group size by class ranking: first or final year

Table 40: Group Size Preference by class ranking: first or final year

<table>
<thead>
<tr>
<th>#</th>
<th>Group size preference</th>
<th>First year</th>
<th>Final year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Student preferred to work with no one else</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>Student preferred to work with one friend</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Student preferred to work with tutor</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Student preferred to work in small group</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Student preferred to work in large group</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Student preferred to use the web</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Student was comfortable working with everyone</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Total number of students by class ranking</td>
<td>41</td>
<td>36</td>
</tr>
</tbody>
</table>

Multiple responses were allowed on this question. Forty-one out of forty-two first year students responded and all thirty-six of the final year students responded. Reporting of preferences were similar between the two classes with the exception of first year female students at ECA who worked together in a large group. The majority of students preferred to work with no one else or with the tutor. Eight first year students preferred to work in a large
Group, while no final year students reported this preference. No first year students were comfortable working with everyone, while eight final year students were comfortable working with everyone.

### 4.13.10 Teamwork – preferred group size by school: WSU or ECA

<table>
<thead>
<tr>
<th>#</th>
<th>Group size preference</th>
<th>WSU</th>
<th>ECA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Student preferred to work with no one else</td>
<td>24</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>Student preferred to work with one friend</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Student preferred to work with tutor</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Student preferred to work in small group</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Student preferred to work in large group</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>Student preferred to use the web</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Student was comfortable working with everyone</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total number of students by school affiliation</td>
<td>49</td>
<td>38</td>
</tr>
</tbody>
</table>

Multiple responses were allowed on this question. Forty-nine responses were recorded from WSU students and thirty-eight responses were recorded from ECA students. Nine students preferred more than one way of working. The majority of students from each school reported that they preferred to work with no one else. At WSU, the second most popular level of involvement was working with one friend. All other ways of working received less than a ten percent response rate. These questions will need to be asked of a larger population and ideally a longitudinal study may follow specific students from first through final year, to better understand what factors play into students’ preference for working in various size groups.

### 4.13.11 Students’ verbal responses during one-on-one interviews: Qualitative data

Qualitative data was gathered through one-on-one interviews between the researcher and students in the landscape studio to answer the question: What problem-solving tools, techniques or theories did students mention using to discover, explore, or resolve studio-based problems?

The following excerpts were gathered during one-on-one interviews at ECA with students who described how they resolved their studio projects. After observing particular students working in the studio, the one-on-one interviews helped the researcher to confirm the research questionnaire responses. Comments about generating alternatives were considered by the researcher to be secondary in importance, because generating a certain number of alternative solutions was a requirement for their project. The researcher was interested in noting whether there were differences in the depth of understanding between first and final
year students. This information was triangulated with responses from the research questionnaire, focus groups and observation of the formal project presentations.

Question 1 asked by researcher: What problem are you working on right now?

First year landscape student #1: “I’m arranging housing and shops around a new plaza.”

Researcher’s notes: After three days of observing this student, houses and shops have rotated on the site plan. The student appeared to have two solutions to present. This day, the student was working on a third alternative. The houses and shops appeared to still be laid out in the original pattern suggested by the tutor on the first day. Secondary problem-solving solution equaled generating three alternatives.

First year architecture student #2: “I’m building a model showing a new entry gate into an existing courtyard.”

Researcher’s notes: Student had built cardboard models of three existing entry arches and was looking to make a fourth new arch compatible with the existing three by cutting out and overlaying existing pattern pieces to assure the scale of the new arch was correct. Student had a problem, in that the width of the new gate was less than half the size of the existing arched openings. There was evidence that patterns were being used, but scale was still an issue. Secondary problem-solving solution used 3-D models to help sort things out.

Final year landscape student #1: “I’m comparing settlement patterns for six rural towns.”

Researcher’s notes: Student was relying on GIS information to map land use patterns. Each town’s streets and buildings were brightly displayed. Similarities in towns’ settlement patterns were evident when overlaid on one another. Land use patterns were helpful to the student conducting the comparison. Secondary problem solving solution = 3-D, Computers.

Final year architecture student #2: “I’m detailing a dance space.”

Researcher’s notes: Student was vacillating between sketching and drafting Palladian window details for a new dance studio. The design was very ornate. Window details mimicked the size and shape of floor to ceiling mirrors. Photos posted up on the design studio wall showed the student’s preference for Italianate 16th century building facades. The student was struggling to replicate desired patterns on vertical and horizontal surfaces. Sketching captured the pattern of sun light coming through the Palladian windows onto the dance floor. As the sun moved across the sky the pattern lengthened. Four-dimensional concepts describing time
and space were being worked out by the student. These were noted by the researcher as further ways of solving problems. Secondary problem-solving solutions were dance and movement.

Sample of students preferred ways of problems solving. Listed below are responses by preference categories following triangulation. Note, first and final year students often differ in their preferred approaches.

Question 2 asked by researcher: What do you see as your problem-solving strengths on this project?

First year landscape student #3: “I take a lot of photos.”

Researcher’s notes: Visual images were used by 95.2% of first year landscape student’s, while patterns were used only 23.8% of the time. Alternative numbers of design solutions were most often dictated by the project brief. In this case three were required. So the student used three. First year design students who were surveyed rarely used the generation of alternative design solutions as a problem-solving tool.

First year architecture student #4: “I like to play around and make a mess. Then, I have to think of a reason for why I made what I made.”

Researcher’s notes: This student’s response represents 58.8% of the first year students who preferred play as a problem-solving tool. Play drops by 32% in the final year of studio.

Final year landscape student #3: “I like to study the history and culture of an area. This is rural farmland and wetlands. At first, I didn’t like the computer. Now I use it all the time. I like working on environmental projects.”

Researcher’s notes: Between their first and final year in design studio, landscape students that were interviewed reported an increased interest in computers by 16%. Their interest in culture increased by 17%. Their interest in the environment increased by 21%. Their interest in history increased by 33%. Their interest in science increased by 33%.

Final year architecture student #4: “I work off of visual images.”

Researcher’s notes: This response is representative of 91.9% of the final year architecture students who report that they use visual images when they design. Visual images may be precedent images or photographs taken by the student; they may be sketches – end of notes.
4.13.12 Most frequent responses during one-on-one interviews

Table 42 One-on-one interview responses based on most frequent responses by students regarding their problem-solving preferences – Data set 2

<table>
<thead>
<tr>
<th>Categories most frequently responded to by students</th>
<th>Researcher’s initial questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logical Progression/Insight/Intuition</td>
<td>What solution generating tools do you prefer when solving design studio problems?</td>
</tr>
<tr>
<td>Innovations/Aha</td>
<td>What motivates you to generate solutions to design studio problems?</td>
</tr>
<tr>
<td>Design/2D/Drawings</td>
<td>List solution generators you prefer to use when designing.</td>
</tr>
<tr>
<td>Visual Images</td>
<td>What design tools do you use to communicate complex design concepts?</td>
</tr>
<tr>
<td>Auditory</td>
<td>What design tools do you use to work through complex design studio problems?</td>
</tr>
<tr>
<td>Tactile/Model/3D</td>
<td>List solution generating tools you prefer when designing.</td>
</tr>
<tr>
<td>Pattern recognition</td>
<td>Too what do you look for inspiration when problem-solving?</td>
</tr>
<tr>
<td>Alternatives</td>
<td>How many alternatives do you typically generate when working on a design studio problem?</td>
</tr>
<tr>
<td>Site Visit/Environment/Narrative</td>
<td>What design tools do you use to generate initial design concepts?</td>
</tr>
<tr>
<td>Digital Graphics/CAD</td>
<td>What problem-solving tools do you use to work out details?</td>
</tr>
<tr>
<td>Hold Contradictory Ideas</td>
<td>What do you feel are your areas of strength or confidence when solving complex problems?</td>
</tr>
<tr>
<td>Art/Science/History/Culture</td>
<td>When first approaching a design studio problem what do you use?</td>
</tr>
</tbody>
</table>

4.13.13 Students’ responses during focus group sessions: Qualitative data

The following questions were asked at the beginning of each of the four focus groups held between the researcher and landscape students.

Do you use computers to draft your site plans?

Do you like to visit the site? If so, when in the design process?

1. Notes from the focus group of first year ECA landscape architecture students sorted by key words: site visit, models and 3-D.

   Researcher: “Do you use computers to draft your site plans?”
   Student: “I like repetition. I like to see the building come into focus. I like to spin it around. Physical space, I like space.”
   Researcher: “Do you like to visit the site?”
Student: “No! Never. It’s too cold.” (Other students laugh.)

Group of students: “We don’t go to the site. It is a waste of our time. We must draw and make models. These are very time consuming.”

2. Notes from the focus group of first year WSU landscape architecture students sorted by key words: CAD, visual images, and site visit.

Researcher: “Do you use computers to draft your site plans?”

Group of students: “Yes, all the time. There is no need to go to the site anymore.”

Researcher: “If you don’t need to visit the site, how do you capture the essence of the place?”

First Student: “I don’t need too.”

Second student: “No, she means how do you do an inventory and analysis of the site. Like hear and smell it.” (Other students laugh.)

First Student: “I can Google photos and everything.”

3. Notes from the focus group of final year ECA landscape architecture students sorted by key words: site visit, group participation and culture.

Researcher: “Do you like to visit the site?”

First Student: “We made several trips to the site.”

Second student: “We forgot our cameras the first trip over there.”

Researcher: “What else do you do when you visit the site?”

Second student: “We were working with a group of pensioners, so we went to meet them and interview them.”

4. Notes from the focus group of final year WSU landscape architecture students sorted by key words: environment, site visit and models.

Researcher: “Do you like to visit the site?”

Student: “My background is in Ecology. I think that the environment is the most important thing. We have to protect it. So, I take lots of pictures on my cell phone and e-mail them back to the studio.

Researcher: “What else do you do when you visit the site?”

Student: “Collect rocks and stuff from the site to use on the site model.”

4.13.14 Students’ responses during formal project presentations: Qualitative data

The Formal Presentation Observation Check List was used by the researcher to record descriptive words and pronouns used by landscape students’ during their formal project presentations.
### Table 43 Summary of students’ responses from The Formal Presentation Observation Check List

<table>
<thead>
<tr>
<th>Students’ Orientation: Social Awareness</th>
<th>Summary of words based on students’ presentations</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘I’-centered vocabulary</td>
<td>defended solution based on intuitive decisions</td>
</tr>
<tr>
<td></td>
<td>presentations often lacked precedent images</td>
</tr>
<tr>
<td></td>
<td>student described solution as being self-generated</td>
</tr>
<tr>
<td>Group Centered vocabulary</td>
<td>aware that a project might have cultural impact</td>
</tr>
<tr>
<td></td>
<td>worked or presented as a team</td>
</tr>
<tr>
<td></td>
<td>used plural pronouns: we decided, our project</td>
</tr>
<tr>
<td>Emphasize Facts / Report</td>
<td>spent time on inventory and analysis</td>
</tr>
<tr>
<td></td>
<td>reported on the environment</td>
</tr>
<tr>
<td></td>
<td>focused on the history of the site</td>
</tr>
<tr>
<td></td>
<td>based design decisions on scientific data</td>
</tr>
<tr>
<td>Triangulation of Problem-solving Tools</td>
<td>Summary of words based on students’ presentations</td>
</tr>
<tr>
<td>Logical Progression</td>
<td>students used Logic</td>
</tr>
<tr>
<td></td>
<td>students used evidence-based solutions</td>
</tr>
<tr>
<td>Insight/Intuition</td>
<td>I-centered reasons were given for decisions</td>
</tr>
<tr>
<td>Innovations</td>
<td>incorporated recent scientific discovery into solution</td>
</tr>
<tr>
<td>Design</td>
<td>all project solutions were rendered in 2D</td>
</tr>
<tr>
<td>Visual</td>
<td>students showed historic art and visual images</td>
</tr>
<tr>
<td>Auditory</td>
<td>one project recorded sounds on site</td>
</tr>
<tr>
<td></td>
<td>students discussed solution for mitigating noise</td>
</tr>
<tr>
<td>Tactile / 3D Model</td>
<td>students presented solutions in 3D model form</td>
</tr>
<tr>
<td>Patterns</td>
<td>Little evidence of patterns in students’ solutions</td>
</tr>
<tr>
<td></td>
<td>[yet, at desk crits all students talked about patterns]</td>
</tr>
<tr>
<td>Alternatives</td>
<td>students did not show viable alternative solutions</td>
</tr>
<tr>
<td></td>
<td>[yet, at desk crits, they worked with many alternatives]</td>
</tr>
<tr>
<td>Site Visit</td>
<td>site visits were referred to in 7/10 presentations</td>
</tr>
<tr>
<td></td>
<td>talking to local people aided in generating solutions</td>
</tr>
<tr>
<td></td>
<td>moving through space helped identify problems</td>
</tr>
<tr>
<td>Narrative/story telling</td>
<td>chronicled process of how problems were overcome</td>
</tr>
<tr>
<td></td>
<td>successfully themed and described project in advance</td>
</tr>
<tr>
<td>Digital Graphics</td>
<td>CAD was used as a way to resolve drafting issues</td>
</tr>
<tr>
<td></td>
<td>computer mapping was used to resolve topo issues</td>
</tr>
<tr>
<td>Hold Contradictory Ideas</td>
<td>play, visio-spatial, and dreaming were not highlighted</td>
</tr>
<tr>
<td>Non-tools</td>
<td>Summary of words based on students’ presentations</td>
</tr>
<tr>
<td>Frustration / Stuckness</td>
<td>told stories of how frustration led to better solutions</td>
</tr>
</tbody>
</table>

Akin has shown how novice students gain confidence and experience less frustration when given a choice in building their own body of problem-solving knowledge and skills. Akin built on Schön’s work that suggested the design process provides a means by which students express their design ideas, but his work does not determine specific approaches used by students to solve design problems. This study has shown a range of approaches mentioned in the literature and used by students in the landscape studio; cataloging this knowledge is new.
for the discipline of landscape architecture. Many areas of scholarship in landscape architecture have yet to be documented. As a side bar to this study, a range of descriptive words and pronouns used by landscape students’ during their formal project presentations were documented. See 4.13.14. This initial data will be expanded as the issue of collaborative group learning is explored by the researcher in future studies.

4.14 Data results to answer research question 7
What problem-solving tools, techniques or theories were mentioned in both sets of data?

4.14.1 Problem-solving tools, techniques and theories – ranked by frequency of mention by educator-authors in the SWOTL articles
Final comparisons between data set 1 and data set 2 were made using twenty of the twenty-two problem-solving categories mentioned in the SWOTL articles and twenty of the landscape architecture students’ preferences. Teamwork and innovation were frequently mentioned in the articles, but were not specifically mentioned by students as preferred methods of solving studio-based problems, therefore they were not used in the final comparisons. Some student-preferred methods of solving studio-based problems were consolidated. These included 2D, 3D, and 4D approaches to design and the four categories of alternatives. For comparison purposes, students’ preference for using alternatives were combined into one entry. Theory was deleted, since it was only mentioned by students.
Table 44  Problem-solving tools, techniques or theories – ranked by frequency of mention by educator-authors in SWOTL articles

<table>
<thead>
<tr>
<th>Pedagogical tools, techniques and theories mentioned by educator-authors in SWOTL articles</th>
<th>Students’ responses mentioning problem-solving preferences</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tool, technique or theory</td>
<td># of mentions</td>
<td>% of mentions</td>
</tr>
<tr>
<td>Culture</td>
<td>21</td>
<td>40%</td>
</tr>
<tr>
<td>Environment</td>
<td>18</td>
<td>34%</td>
</tr>
<tr>
<td>Site Visit</td>
<td>16</td>
<td>30%</td>
</tr>
<tr>
<td>Hold Contradictory Ideas</td>
<td>14</td>
<td>26%</td>
</tr>
<tr>
<td>Intuition</td>
<td>12</td>
<td>23%</td>
</tr>
<tr>
<td>History</td>
<td>11</td>
<td>21%</td>
</tr>
<tr>
<td>Narrative</td>
<td>11</td>
<td>21%</td>
</tr>
<tr>
<td>Talk</td>
<td>10</td>
<td>19%</td>
</tr>
<tr>
<td>Pattern</td>
<td>9</td>
<td>11%</td>
</tr>
<tr>
<td>4D</td>
<td>8</td>
<td>15%</td>
</tr>
<tr>
<td>Science</td>
<td>7</td>
<td>13%</td>
</tr>
<tr>
<td>Art</td>
<td>7</td>
<td>13%</td>
</tr>
<tr>
<td>Model</td>
<td>7</td>
<td>13%</td>
</tr>
<tr>
<td>2D</td>
<td>6</td>
<td>11%</td>
</tr>
<tr>
<td>Alternatives</td>
<td>5</td>
<td>9%</td>
</tr>
<tr>
<td>Movement/Music/Dance</td>
<td>5</td>
<td>9%</td>
</tr>
<tr>
<td>Visual Images</td>
<td>5</td>
<td>8%</td>
</tr>
<tr>
<td>3D</td>
<td>4</td>
<td>8%</td>
</tr>
<tr>
<td>Play</td>
<td>3</td>
<td>6%</td>
</tr>
<tr>
<td>Logic</td>
<td>2</td>
<td>4%</td>
</tr>
</tbody>
</table>

Twenty problem-solving tools, techniques or theories were mentioned in both sets of data. Data was ranked by frequency and percent of mention in the articles found in columns two and three. Cultural awareness, environmental sensitivity and site visits were promoted by educator-authors as having educational value when solving problems in the landscape studio. Educator-authors’ interest in cultural awareness and site visits were shared by students, but a negative difference was recorded for the environment. Articles on topics outside the design disciplines were rare, namely, history, science and art; although many students reported using these subjects to draw inspiration for design solutions. Educator-authors published few articles mentioning play, 3D or visual images in relationship to problem-solving, although students often mentioned these topics.

4.14.2  Problem-solving tools, techniques or theories – ranked by frequency of mention by landscape students in the survey responses
Twenty problem-solving tools, techniques or theories were mentioned in both sets of data. Data was ranked by frequency of mention by students in the research questionnaire, as shown in columns two and three. Over fifty percent of the students responding to the research questionnaire mentioned that they preferred using the tools listed in the first ten rows: alternatives, visual images, play, science, art, site visit, 2D, culture, 3D modeling, and an ability to hold contradictory ideas. Ninety-seven percent of the students mentioned and, or, showed evidence of using two to five alternatives in their problem-solving process. In ninety percent of their responses, students mentioned using visual images. Play was used by sixty-five percent of the student respondents, as was generating ideas, science, art, and 2D drawing. Students mentioned the importance of cultural and site visits in over fifty percent of their survey responses. Mention of the environment was the only problem-solving approach mentioned more often in the literature than by students.
4.15 Data results to answer research question 8

Were gaps evident between the recommended problem-solving tools, techniques or theories mentioned in the educator-authored articles and those used by students? If so, what were the gaps?

4.15.1 Problem-solving tools, techniques or theories – ranked by percent difference

Table 46 Comparison of recommended problem-solving tools, techniques or theories mentioned by educator-authors in the articles and by landscape students in the research questionnaire responses – ranked by percent difference

<table>
<thead>
<tr>
<th>Pedagogical tools, techniques and theories mentioned in SWOTL articles</th>
<th>Students' responses mentioning problem solving preferences</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tool</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Alternatives</td>
<td>5</td>
<td>9%</td>
</tr>
<tr>
<td>Visual images</td>
<td>5</td>
<td>8%</td>
</tr>
<tr>
<td>Play</td>
<td>3</td>
<td>6%</td>
</tr>
<tr>
<td>Science</td>
<td>7</td>
<td>13%</td>
</tr>
<tr>
<td>3D</td>
<td>4</td>
<td>8%</td>
</tr>
<tr>
<td>Art</td>
<td>7</td>
<td>13%</td>
</tr>
<tr>
<td>2D</td>
<td>6</td>
<td>11%</td>
</tr>
<tr>
<td>Hold Contradictory Ideas</td>
<td>14</td>
<td>26%</td>
</tr>
<tr>
<td>Site Visit</td>
<td>16</td>
<td>30%</td>
</tr>
<tr>
<td>Pattern</td>
<td>9</td>
<td>11%</td>
</tr>
<tr>
<td>History</td>
<td>11</td>
<td>21%</td>
</tr>
<tr>
<td>Model</td>
<td>7</td>
<td>13%</td>
</tr>
<tr>
<td>Intuition</td>
<td>12</td>
<td>23%</td>
</tr>
<tr>
<td>Narrative</td>
<td>11</td>
<td>21%</td>
</tr>
<tr>
<td>Logic</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>Culture</td>
<td>21</td>
<td>40%</td>
</tr>
<tr>
<td>Talk</td>
<td>10</td>
<td>19%</td>
</tr>
<tr>
<td>Movement</td>
<td>5</td>
<td>9%</td>
</tr>
<tr>
<td>4D</td>
<td>8</td>
<td>15%</td>
</tr>
<tr>
<td>Environment</td>
<td>18</td>
<td>34%</td>
</tr>
<tr>
<td>Innovation</td>
<td>16</td>
<td>30%</td>
</tr>
<tr>
<td>Teamwork</td>
<td>22</td>
<td>42%</td>
</tr>
</tbody>
</table>

A comparison was made of problem-solving tools, techniques or theories mentioned by studio-educators in the articles and by landscape students in the research questionnaire responses. These were ranked by percent difference. Positive percentage in the difference column indicated a particular tool, technique or theory was reported more frequently by students in the research questionnaires than by educator-authors in the articles. A negative percentage in the difference column indicated a particular problem-solving approach was reported more frequently by educator-authors in the articles than it was by landscape students.
Two major gaps were evident between the recommended problem-solving tools, techniques or theories mentioned in the educator-authored articles and those used by landscape students. Teamwork and innovation were listed in the articles; neither were mentioned by students. Teamwork was recommended as a problem-solving tool twenty-two times in the articles; however, the majority of students regardless of gender, class or school preferred to work by themselves. This finding represents a gap between what the articles report and what students reported as their preferences for participating in group work. Innovation was reported sixteen times in the articles. Innovation was not mentioned in the students’ surveys. Lesser gaps involved students’ extensive use of alternatives, visual images, play, and science, while few educator-authored articles were published on these topics.

In summary, the articles in data set 1 mentioned twenty-two approaches to problem-solving. These were deemed to have educational value when used in the landscape studio. When surveyed, landscape students in data set 2 preferred thirty-one ways to solve studio-based problems. Similar students’ preferences were consolidated to better align with categories in the articles. Lists were compiled for each set of data, then compared to determine whether similar approaches to solving problems existed. Twenty approaches to problem-solving were found in common. Comparison of the two lists did not infer any more information than the fact that interest in twenty problem-solving approaches was shared by educator-authors and landscape students. Gaps existed between the two lists. The most notable gap was teamwork. Much has been written about the benefits of teamwork, but this study found a gap existed between the benefits perceived by studio educators and students participating in collaborative group learning. This gap was made more evident when students were specifically asked how they preferred to work on studio projects. This is an area of interest the researcher anticipates examining in future research projects. A less notable gap existed between recognition of innovation by educators and lack of mention by students. Further research must be done to determine relationships between educator-authors’ approaches to problem-solving and approaches preferred by landscape students.
Discussion

5.1 Discussion of research methods for data set 1

5.1.1 Coding Criteria

Coding criteria were used to gather specific information from each article. This included cataloging the type of research found in each article: pedagogical, disciplinary or non-pedagogical. Information gathering included cataloging the problem-solving tools, techniques and theories, which were mentioned in each article. Articles reflected each educator’s recommendations for using specific problem-solving tools, techniques or theories and were presented in a scholastically rigorous method.

The initial sorting of articles (n=120) from Landscape Journal, Landscape Research, and Landscape Review mentioned one or more approaches to problem solving. This represented just over twenty-five percent of the total number of articles (n=467) in the original census. A second sorting, using Boyer’s definition of scholarship identified (n=68) articles that had pedagogical research value. Following a third screening of articles using Weimer’s framework for identifying SWOTL literature, fifty-six articles remained in data set 1. Data from these fifty-six articles were screened as wisdom of practice, research scholarship and promising possibilities literature. Later, SWOTL articles were sorted alongside Cross and Steadman’s multiple scholarships of teaching and, again, alongside Groat and Wang’s practice-based or non-pedagogical research methods. Educator-authored articles on topics involving the teaching or learning of problem-solving activities in the design studio were evaluated for content using open-ended coding based on key word protocol.

5.1.1.1 Participants

Authors were known only through their published articles. No contact was made with studio-educators who had authored the pedagogical research on specific problem-solving tools, techniques or theories used in this study.

5.1.1.2 Strengths of instrument

All sorting methods are replicable. Applying each method of assessment to these articles established a baseline of scholarly work on teaching and learning in the landscape architecture studio. Key word search allowed for the cataloging of all mentions of activities associated with problem* or the solving* of problems. The first sorting of categories included: tools, instruments, means, and devices; techniques, methods, processes, practices,
and skills; theories, models, ideas, schemes, and designs; along with strategies, plans, approaches, and tactics.

5.1.1.3 Weaknesses of instrument
No contact was made with studio educators who had authored the pedagogical research on specific problem-solving tools, techniques or theories used in this study. A list of specific theories was not distinguished when gathering the original data. This resulted in the lack of detailed information that would have been needed to follow up or compare with students’ reported use of problem-solving theories.

5.1.1.4 Record Keeping
All articles were double-blind coded by the researcher and a fellow graduate student. Words, phrases and sentences from each abstract, key word list and full text article were analyzed with the participation of the second coder. After analyzing the text, the key concepts and word patterns were extracted and classified into categories. Categories were built and fine-tuned to provide a consistent response to linguistic variations in the text.

All data entries were made by the researcher. Some responses to the coding criteria were recorded using IBM® SPSS® Text Analytics for Surveys. Some of the open-ended responses were entered directly onto Excel Spreadsheets. Other responses were coded manually, sorted into categories, and then entered onto an Excel spreadsheet.

5.1.1.5 Summary
Data set 1 consisted of academic articles authored by studio-educators with little or no formal teacher training for higher education. This form of literature is often referred to as pedagogical research. The rigor of this form of scholarship varied widely. The variety of research methods reflected the professional background of the educators; many of them were academic practitioners and their articles evidenced use of non-pedagogical research methods.
5.2 Discussion of Research Methods for data set 2

5.2.1 Research Questionnaire

The research questionnaire was designed by the researcher. Its purpose was to find out from students how they preferred to discover, explore and, or, resolve studio-based projects. The questionnaire was designed to be used within the context of first and final year landscape studios. Each landscape studio’s project had a different site, but programming requirements were remarkably similar.

5.2.1.1 Participants

Seventy-eight (n=78) landscape architecture students participated in this study. Students were enrolled in their first or final year of studio at Edinburgh College of Art and at Washington State University. All students spoke English as their first or second language.

A convenience sample was used to gather qualitative data. Class sizes were small, averaging under 20 students. Each studio class had an equal number of males and females. During the course of the study, academic practitioners, tutors, individual students and entire studio classes were also observed. This “method of triangulation” (Gay, 1996, p. 584) was recommended as a way to strengthen reliability. The sampling method integrated all students’ responses in the final analysis.

5.2.1.2 Tasks required of participants

All students within the first and final year landscape studio were asked to complete the questionnaire. They were given 45 minutes of class time. The questionnaire was paper and formatted on two sides. Most students completed the survey in the given time, but some students required more time. Students’ requiring additional time were granted it and returned their surveys the next day.

At the time of administering the survey, students were half-way through resolving their studio projects. Most students had initiated one or more generative problem-solving tool in the process of designing their projects. These were evident as tangible products on their desks or in their computers. While students’ individual projects had no direct connection with the research questionnaire, they did play a minor role in how students related to the research questionnaire. For example, students used their studio projects to illustrate answers to open ended questions regarding problem-solving as a tangible activity. This was especially evident in the critique session presentations.
5.2.1.3 Strengths of instrument

Each studio class had slightly more males than females. Questions addressed topics associated with the problem-solving process. Responses were simple. Coding for statistical analysis included yes/no, Likert Scale, and open-ended responses. Taking this survey provided students an opportunity to reflect on their own problem-solving process and to respond directly and personally to the research questions. This led to lively follow-up conversations as students contributed their thoughts through the next three survey instruments: one-on-one interviews, focus groups, and formal presentations.

Another merit of the research questionnaire was its simple layout. Students’ responses were quickly and easily completed and converted to key words. As students’ studio work unfolded in a short amount of time, use of key words allowed subsequent data to be gathered efficiently. This made it easy to cross-reference responses from subsequent survey instruments. Later, the list of key words prompted considerations about design pedagogy that could only be gleaned from the survey of journal articles. Key words allowed the students’ preferences to be linked to journal articles and educators’ comments.

The research questionnaire was the first of four instruments used to gather data from students. It prepared students to think about the ways in which they identify, explore and resolve problems. The questionnaire provided students with a vocabulary to describe their work. Use of this vocabulary was evident in the one-on-one student interviews. The vocabulary in the survey itself provided students with a new way of thinking and describing what they were doing. This may be a significant finding and a topic for further research.

Triangulation was designed into the survey process. Designated questions were embedded in the research questionnaire, noted following one-on-one interviews, collected in focus group sessions and recorded on the formal presentation check lists. This system of overlapping questions allowed students’ responses to be cross-referenced even prior to final data analysis.

5.2.1.4 Weaknesses of instrument

First, the instrument was too long. Second, it was printed front and back. Some students needed to be reminded to turn the questionnaire to the back page. Third, there were superfluous questions. Fourth, the use of colored ink confused some students who elected to skip questions typed in red or green ink. Fifth, the questionnaire was not a standard instrument. While this might have been a validated reason for weakness, several questions were replicated from Steffert’s work. Self-designed instruments have been shown to be less
likely to be replicated than are standardized survey forms (Gay, 1996), however, using Steffert’s questions did strengthen the instrument.

5.2.1.5 Record keeping process
The administering and coding of all questionnaires was handled by the researcher. Students responded to the questions in written form. The goal of the research questionnaire was to allow students a wide range of response options. Options included yes/no, preference, fill-in the blank, Likert scale, free-hand sketches, and open-ended responses. All questions were written in the English language.

Anonymity was given to all students because no names were recorded. Student responses were coded by demographic information and by key word variables. Evaluation of multiple cases generated new variables for each embedded question category. Data was sorted and cross-checked using Microsoft Office Excel 2007, and later the 2013 version. All records were kept in a secure file by the researcher.

5.2.1.6 Results
The research questionnaire accomplished its intended goal of recording the ways in which students resolved design studio problems. Simple relationships were identified. These included recording a relationship between problem-solving tool use and a student’s satisfaction with the problem-solving process; descriptive evidence of an enhanced understanding of particular discipline-based and interdisciplinary tool use during the design process, and the identification of tools ranging from traditional to innovative. These pedagogical relationships were verified as students’ reported the progress of their studio projects through the other three instruments.

5.2.1.7 Comments
Studio activities were assigned by the studio tutors independent of this study. Assignments varied by site and program requirements based on course curriculum. While individual studio assignments differed in detail, pedagogical approaches to problem-solving were remarkably similar. The research questionnaire ascertained students’ problem-solving approaches by letting students describe, in as many ways possible, how they resolved their studio projects. Student responses were later correlated with the separate list of problem-solving tools, techniques and theories as part of the analysis of academic articles in data set 1. The multi-method approach to gathering data, combined with the open-ended nature of the survey
process and instruments allowed for new discoveries to be made concerning relationships occurring in the studio.

5.2.2 One-one-one interviews with students
One-on-one interviews have the unique purpose within qualitative research of providing researchers with “data not obtainable in any other way” (Gay, 1996, p. 223). Often students will share information with the researcher that is unique to their personal situation. In this instance, students shared information that validated the research questionnaire and added depth and meaning to the survey as a whole. The one-on-one student interviews served their purpose.

5.2.2.1 One-on-one in-studio interviews resembled ‘desk crits’
Students were familiar with this form of interaction and dialogue. Conversation provided information concerning the student’s design work, preferred ways of working on projects, and studio life style affecting innovative or creative output. Students’ descriptions of their studio world helped put a face to the information gathered in the research questionnaire.

5.2.2.2 Participants
Eligible participants were first and final year design studio landscape architecture students who had already completed the research questionnaire. Time permitted half the students to participate. Effort was made to interview students seated at every other desk in the room.

5.2.2.3 Tasks required of participants
Students had to be willing to talk to the researcher and show their projects in varying stages of completion. This was voluntary.

5.2.2.4 Strengths of instrument
Students were eager to show examples of their work, describe how they preferred to approach solving studio projects, and express their opinions about the studio teaching and learning environment. Topics addressed in the research questionnaire that needed clarification were revisited. Perplexing comments, ambiguous or open-ended responses on the questionnaire were able to be clarified by one-on-one interviews with students for whom English was their second language. Answers were offered by the students concerning events, or things involving a student’s project that the researcher had no way of knowing or observing. New topics, while perhaps interesting, were not recorded unless they had an impact on understanding students’ preferences for tools, techniques or theories influencing the
resolution of their project. The interview session served to strengthen triangulation of data gathered from the other survey formats.

It is the researcher’s opinion that interviews with students at their desks were most informative when classmates were not present. In several instances, detailed information gained during the interview informed open-ended comments that have been written on the research questionnaire. Multiple interviews per studio aided in verifying common influences and helped facilitate comparisons of student preferences across class rank, gender and school/institution.

5.2.2.5 Weaknesses of instrument
Interviews were time consuming and required prior arrangement with the studio tutor to gain access to the studio and to the students. Due to these constraints, only half of the students in each class were selected to be interviewed. Interviews taking place at student’s desks were apt to interfere with other students’ work. Students were less inclined to share their thoughts when there were outside distractions, such as meeting in the cafeteria, or in the field.

One unanticipated factor in the interview process was the role of the studio tutor. When present, the tutor’s attitude toward this study held influence over students’ participating in the interview process. If negative, the amount of time devoted to the conversation was shortened and enthusiasm when sharing examples of their work was dampened. This was a reason for interviewing some students outside the studio environment.

Because spontaneous conversation was difficult to record, a tape recorder was used. The tape recorder accurately recorded conversations, but proved to add one more layer of inhibition to some already shy students. It was discarded after the first five interviews.

5.2.2.6 Record keeping process
The open-ended interview format made note taking rather unstructured. The researcher asked and received answers to three open-ended exploratory questions. Notes were taken on paper by the researcher, while students expressed their preferred ways of working in the landscape studio. When a student mentioned one of the key words used in another survey instrument, the researcher would jot it down. In this way, the essence of the conversation was condensed into key words. Detailed handwritten notes were made by the researcher immediately after each personal interview with a student. This post-interview process left time for reflection by the researcher.
5.2.3 Focus groups
Two focus groups were held at Edinburgh College of Art in October of 2006. One session was held for first year students and a second session was held for final year students. The meetings had ninety-five percent attendance. Approximately all of the students who had completed the research questionnaire attended; half of these students had met with the researcher for a one-on-one desk critique. In December of 2008, two sessions were held with first and final year landscape architecture students at Washington State University using a similar format. Focus group sessions lasted approximately one hour.

5.2.3.1 Participants
Each session was attended by approximately twenty students. There were slightly more male than female students in attendance. First year students ranged in age from 17 to 18 years old. Final year students ranged in age from twenty to thirty.

5.2.3.2 Discussion of students’ use of site visits to inform their projects
Qualitative data was gathered to better understand students’ practice of visiting their project site. Students discussed the use of CAD, visual images, photos, building 3D models, designing in 2D, group participation, and the cultural context of their project site. The researcher asked each focus group to move to consensus on the three open-ended exploratory questions. The primary topic of conversation suggested that the virtual studio had become important to students’ sense of place and it had greatly affected their design sensibilities. First year students said that they were eager to use computer technologies and preferred to substitute a virtual experience for an actual site visit. Final year students, on the other hand, held to the belief that site visits were a necessary part of site analysis and that meeting the local people provided a valuable dimension on the way to project resolution. All students agreed that the virtual studio strengthened the idea of global landscape architecture and it was here to stay!

5.2.3.3 Strengths of instrument
Interviewing a number of students collectively, the researcher was able to make efficient use of time and to gain insight into different facets of the landscape architecture studio and the ways in which students worked. The researcher built on a growing understanding of how studio problem-solving skills were promoted by tutors and used by students. Given the circumstances and time constraints, the focus groups were successful.
The focus groups promoted a feeling of camaraderie, coming on the heels of the research questionnaire, meeting together helped the researcher and the students to clarify issues generated by the research questionnaire. The sessions were used by the researcher to verify vague open-ended comments and track trends across classes: first and final year.

5.2.3.4 Weaknesses of instrument
The size of focus groups, averaging 17 to 20, made it difficult for all participants to express their views in the one-hour time allotted. Shy or quieter students did not tend to join in the conversation around the conference table. Some students’ views went unexpressed; although a few students handed the researcher well doodled notes following focus group sessions. Of the four methods of gathering data, this method proved spontaneously insightful and at the same time proved the least accurate way of tracking individual comments.

5.2.3.5 Record keeping process
Notes were taken at each focus group session by the researcher. A sketch denoting the seating arrangement helped the researcher to re-enact the conversation following the session. A tape recorder was used. Detailed note taking and reflection followed each session (Gay, 1996, pp. 224-225). Key words were extracted from the recorded conversation. Notes were later sorted by key words and phrases and triangulated with results from the research questionnaire and one-on-one desk critiques. Handwritten notes proved most valuable when cross-validating and triangulating with other survey instruments: the research questionnaire, one-on-one desk crits, and the formal project presentations.

5.2.4 Formal project presentations
The Formal Presentation Observation Check List was a convenience check list developed by the researcher based on data results from the first three survey instruments. The check list allowed the researcher to record two things, students’ social awareness and their problem-solving processes. A pilot test was run during a Tapestry critique session at Edinburgh College of Art prior to observing the landscape architecture student presentations.

5.2.4.1 Participants
Observation and evaluation was limited to students who had participated in the research questionnaire, in an interview and, or, a focus group. This increased the number of possible triangulations for individual students and made the research more rigorous.
5.2.4.2 Tasks required of participants
Students presented their projects at a regularly scheduled critique session conducted by the studio tutors. Similar jury sessions have been discussed in the literature (Ochsner, 2000). Students were given three to five minutes in which to present their projects. Presentations followed a conventional format: introduction of project brief, outline of opportunities and constraints, review of idea generation, description of proposed design, and explanation of project solution. A wide range of graphic submissions were allowed. After the presentation, students fielded comments from tutors, design professionals, and fellow students for up to 10 minutes.

5.2.4.3 Strengths of instrument
A pilot test run during a Tapestry critique session streamlined the note taking system to key words. Standardized critique sessions provided coherence and the researcher’s familiarity with the critique process was a benefit to conducting this portion of the survey. The check list allowed the researcher to record students’ ways of describing their projects based on the information they provided during their studio project presentations. Students presented in a group setting, under social and academic pressure, and with a real time constraint. These pressures required students to distill their thoughts and to describe their design solutions in the best light possible. The Formal Presentation Observation Check List Key efficiently recorded all student presentations in a more subtle or secondary way than the other survey instruments.

5.2.4.4 Weaknesses of instrument
Two weaknesses were evident. Students’ ways of describing their work were often convoluted and did not fit the key word list. At the time the checklist was compiled, not all key words describing problem-solving had been identified through data analysis of the first three sets of survey instruments.

5.2.4.5 Record keeping process
At the formal project presentation the researcher sat in the back of the room and took notes by marking the number of times a given student referred to the key words during his or her presentation. The researcher did not actively participate in the event e.g., the student presentations or the question and answer session that followed.

The key word check list was developed following a pilot critique session in Tapestry. This allowed the researcher to record students’ key words. It also organized the data into a format
ready for analysis and triangulation. Often a line for comments enhanced the qualitative value of the observations. A frequency count was made of the number of times key words from the articles and the reports appeared in the student’s presentation. This was unique data not provided in the other survey instruments. Also, the researcher was able to listen and better understand how each student went about solving his or her unique problem(s).

5.2.4.6 Results
The critique session presentation observations accomplished the intended purpose within the framework of the overall inquiry by allowing students to explain their completed projects to landscape faculty and professionals. Students exhibited their ability to describe their problem solving process in a number of ways; verbally, visually and three-dimensionally using tactile models.

5.2.4.7 Summary
During data analysis, The Formal Presentation Observation Check List Key was successfully used to triangulate problem-solving approaches as evidenced through the students’ self-evaluation research questionnaire, personal interviews, and focus groups. It recorded descriptive words and pronouns used by students’ during their presentations. It provided qualitative data, which aided in better understanding students’ level of social awareness with respect to their problem-solving activities. The check list also provided a record of why students made certain decisions and recorded some of their frustrations that led to unexpected solutions.

5.2.5 Reflection on Research Methods used for data set 2
This portion of the study used multiple educational research methods using a convenience sample of undergraduate landscape architecture students. This study might be classified as ‘descriptive research’ because a questionnaire was used to gather data to find out how students approach their design studio work (Gay, 1996, p. 24). This study might also be classified as ‘causal-comparative research’ because a cause-effect relationship was investigated but the independent variable was not manipulated. The researcher could not and did not determine which students were in the first year design studio and which were in the final year design studio; nor did the researcher assign landscape architecture students to their respective design disciplines. These were defined as independent variables for the life of this study. This study might be classified as ‘quantitative in character’ because student participants were asked specific questions regarding how they currently were working
through the design or problem-solving process. This study was ‘qualitative in character’ because participant observation was used during critique sessions to collect student comments pertaining to how they worked through their design or problem-solving process. In this way, qualitative research was used as a method of triangulation along with the quantitative research to describe how students preferred to solve problems. This study successfully applied multiple educational research methods to gather and analyze data.

This study was not designed to determine probability of how first and final year students solved problems, rather, it was designed to provide a multiple-case study of how students at two schools prefer to solve problems. This was why the population of design students attending the two schools determined the number of survey responses. The sample population was the census population. There were equal numbers of students at ECA and WSU (n=39). There were slightly more first year students and slightly more males at each school. All students completed the questionnaire. No statistical analysis was conducted, because the census of responses was reported. Primary sources of data were preferred when gathering information from students for this study. Full cooperation of students was important in selecting the data gathering instruments. Because follow-up responses were not necessary. This increased the validity of the data. Practical restrictions of time, cost and lack of research assistance also came into play.

On reflection, the sample size was small and students at only two schools were queried. Other instruments could have assessed students’ intelligence, or personality. Today, a different approach to data gathering might yield more generalizable results. Perhaps the questionnaire could be administered by volunteer trained tutors at a greater number of schools throughout the United Kingdom and the United States. Ideally, a longitudinal study would be set up to track the same students from their first year design studio through graduation. The study would focus on tracking students’ acquisition of problem-solving tools, techniques and theories over time. Today, the researcher might use social media, such as a chat room, to replicate focus group interaction. SKYPE might be used to conduct one-on-one interviews and view students’ final presentations. There is probably no getting around most studio’s small size or account for student attrition between first and final year. An advantage of using social media would allow more schools to be included in the research while staying within the researcher’s limited budget. An advantage of studying more students over time would be the probability of seeing trends in studio pedagogy. An advantage of involving studio tutors
in the administration of the questionnaire might be that they bring new insights to this topic. These are several mechanisms for streamlining the survey process.

In retrospect, the researcher might have selected a different qualitative sampling technique to study students’ problem-solving activities. A case study method might have allowed more in-depth study of students within their studio context. A case study method might have allowed the researcher the opportunity to observe and interview students representing a greater number of schools. Sampling might have been conducted via SKYPE or in person, if time and funding had been provided. When compared to the multiple survey methods used in this study, using a case study method would have probably allowed for similar research actions to take place. These actions would have included setting boundaries defined to connect directly to the research questions and the construction of a framework to help the researcher discover, confirm, and qualify the constructs that undergird the study. One concern regarding analysis of multiple case studies would have been the complexity of data beyond 15 case studies (Miles & Huberman, 1994, p. 28). When compared to the multiple survey methods conducted for this study, data was gathered and analyzed for seventy-eight students.

5.3 Hypothesis revisited
This study provides evidence that the landscape studio has supported scholarly problem-solving pedagogy and students have been solving studio-based problems using tools, techniques and theories deemed by studio educators to have educational value. The hypothesis links multiple methods of assessing the scholarly rigor of pedagogical research and applies them to landscape studio problem-solving tools, techniques and theories.

5.4 Research questions revisited

5.4.1 Question 1
Evidence was found to indicate research on problem-solving activities had taken place in the discipline of landscape architecture. Sorting took place using key words. Articles were read for evidence the author had advanced problem-solving knowledge.

5.4.2 Question 2
Evidence was found to indicate studio educators had authored academic articles that qualified as scholarship of teaching literature. Academic articles were successfully sorted using definitions from Boyer’s Model of Scholarship and Cross and Steadman’s Multiple
Scholarships of Teaching. New discoveries were reported specific to design studio pedagogy; domain-specific knowledge was being applied; discipline-specific knowledge was being shared across disciplines; and approaches to teaching and learning were pedagogically rigorous.

5.4.3 Question 3
Evidence was found to indicate some landscape studio educators had authored scholarly work on teaching and learning literature. Weimer’s classification system was successfully used to assess whether or not a SoT article qualified as SWOTL. If the article contained evidence of SWOTL, it was considered to be worthwhile pedagogical information written to advance problem-solving knowledge beyond the discipline of landscape architecture. By extension, each example of SWOTL supported either the scholarship of discovery, integration, application, or teaching in the landscape studio. Weimer’s scheme for evaluating SWOTL literature becomes a framework on which landscape studio educators may build. This study provided evidence that SWOTL has the potential to strengthen academic rigor in work conducted by studio-educators and academic practitioners by providing them a literary venue for sharing unique forms of pedagogical problem-solving knowledge with a wider audience.

5.4.4 Question 4
Evidence was found to indicate that practice-based methods of research had been used to generate pedagogical research on problem-solving activities taking place in the landscape studio. Groat and Wang’s descriptions were used to identify a range of social science and architectural research methods. If an article contained evidence of architectural research methods, it was assumed that one or more of the methods had been useful when training students to solve complex studio-based problems. By extension, integrating architectural research methods into studio curriculum provides educators and students a broader range of problem-solving resources. Cataloguing these problem-solving resources was a positive step toward advancing pedagogical research methods in both the landscape studio and interdisciplinary studios. This was a new way of assessing the use of practice-based methods of research by studio educators.

5.4.5 Question 5
Evidence was found to indicate problem-solving tools, techniques or theories were specifically mentioned in scholarly work on teaching and learning literature as having educational value in the landscape studio or were associated with a studio-based project. All
mention of tools, techniques or theories were collected and cataloged using Neuendorf’s content analysis and key word protocols. The final list documented educator-authors’ recommendations. It was later compared to similar approaches preferred by landscape students.

5.4.6 Question 6
Evidence was found to indicate students used a wide variety of problem-solving tools, techniques or theories to discover, explore, or resolve studio-based problems. This study used a multi-method approach to collect students’ preferred problem-solving tools, techniques and theories. Preferences were gathered using open-ended questionnaires, one-on-one interviews, focus groups, and observations of formal project presentations. Students successfully demonstrated their preferences and reflected on them via these methods.

While data set 2 represented a limited sample of students, it was, nevertheless, an important step toward generating a comprehensive list of student-preferred approaches to solving complex studio-based problems. This list proved valuable when discussing similar problem-solving tools, techniques and theories reported in the data set 1 articles. By extension, this list may serve as a benchmark for future scholars studying problem solving topics.

5.4.7 Question 7
Evidence was found to indicate twenty problem-solving tools and techniques were shared amongst the articles and the students in the landscape studio.

5.4.8 Question 8
Evidence was found to indicate gaps existed between the recommended problem-solving tools, techniques or theories mentioned in the educator-authored articles and those used by students. The first gap occurred with the mention of teamwork. Educator-authors recommended teamwork as a way to teach students to solve problems, but students preferred to work with no one else or with one friend. Another gap occurred with the mention of innovation. Educator-authors recommended innovation as a way to teach students to solve problems, but students did not mention it in their survey responses. Theory was also found to be in the gap. Further study will be required to understand whether these gaps influence teaching and learning in the landscape studio.
5.5 Discussion in relationship to previous research

5.5.1 Data set 1
Application of Boyer’s model of scholarship to the sorting of articles in data set 1 produced results consistent with previous work done in the field of scholarship of teaching. Sorting of scholastically rigorous pedagogical research was strengthened through the application of Cross and Steadman’s definitions of Multiple Scholarships of Teaching. It should be noted that research needs to continue, if scholars are to draw a parallel between Cross and Steadman’s work in the classroom and work that takes place in the landscape studio. Weimer’s classification scheme was successfully applied to the articles authored by studio educators. This was done under the assumption that studio educators qualified as academic practitioners, e.g., the very authors Weimer was targeting for assessment. Analysis of data gathered using the coding criteria resulted in identification of articles containing value as scholarly work on teaching and learning. Copious research by CFAT and affiliates supported the methods of sorting articles used in this study. Groat and Wang’s definitions of architectural research methods were tested in a new way and found to be valuable in this study. This researcher anticipates future scholars and journal editors may use this study as a benchmark by which they evaluate new pedagogical research on studio-based problem-solving topics.

5.5.2 Data set 2
A list of student-preferred approaches to problem-solving was gathered from first and final year landscape architecture students studying in Edinburgh, Scotland and in Spokane, Washington. This list was compiled from a number of survey instruments and the researcher’s unique opportunity to observe students working in landscape studios on two continents. Since this study represented a small convenience sample of students, the researcher suggests that a larger study be conducted in the future. A more robust survey of students’ problem-solving preferences would benefit those interested in advancing the body of problem-solving knowledge and would provide opportunities to expand the way studio educators teach problem-solving. More important, a larger sample size would substantiate results from this study or produce new evidence to advance our understanding of the topic. The latter is likely, since 2008 the use of computers in the studio has become commonplace, interdisciplinary studios encourage student collaboration and study abroad programs offer
students a global perspective when preparing to solve complex cultural and environmental issues.

Findings from data set 2 will provide future scholars with a comprehensive baseline of problem-solving tools, techniques and theories favored by first and final year landscape students at two universities. These students suggested to the researcher a variety of problem-solving approaches. Most, but not all were mentioned in the academic articles. Students were interested in the number of alternatives they produced on the way to finding a viable solution. Students understood 2D hand drawing to also encompass sketching, photography and colour rendering. Students defined 3D in a broader sense then many of the educator-authors; listing playing with puzzles, building physical scaled models and simulations via computer aided design. Further, 4D was understood by students to include many things they did not have words to explain such as the space/time continuum and moments of Aha! Content analysis and key word searches using pedagogic descriptors identified ways educators teach and students learn to solve studio-based problems. These survey instruments were successfully used to gather as many original answers as possible. Knowledge gained using these assessment methods was found to be replicable, transferable and generalizable to teaching faculty in the discipline of landscape architecture. Journal editors, scholars, and studio educators have new benchmarks by which to evaluate the scholarly rigor of academic articles reporting on studio teaching and learning activities.

5.5.3 In summary
A series of overarching questions informed this study. First, were the questions of scholarly rigor on the part of studio educators tasked with conducting and disseminating pedagogical research based on studio teaching and learning activities. Responses to these questions were found by examining educator-authored articles using a series of assessment methods endorsed by scholars of education and scholars of design. Second, were the questions regarding the teaching and learning of problem-solving tools, techniques and theories. Responses to these questions were found by examining articles in data set 1 to find out what educators recommended as basic knowledge, as well as asking students in data set 2 how they preferred to discover, explore, or resolve studio-based problems. Finally, there were questions regarding the educational value of the landscape studio. Responses to these questions involved looking at the interdisciplinarity and the diversity of the studio teaching and learning experience, as well as the scholastic rigor of the problem-solving activities that
took place in the studio environment. Despite the fact that the two sets of data did not have a direct correlation, results provided a picture of studio-based pedagogy in the late 1990s and 2000s. Results showed that the landscape studio provided a unique form of education that supported pedagogical research and hands-on learning focused on solving complex cultural and environmental problems.

5.6 **Significant contributions through this study**

A significance of this study was its seamless application of Boyer’s model of scholarship, Cross and Steadman’s definition of multiple scholarships of teaching, and Weimer’s framework for analyzing the scholarly rigor of educator-author literature to 467 articles in data set 1. Successful application of these assessments stemmed from their prior use by the Carnegie Foundation for the Advancement of Teaching and scholars in other practice-based disciplines. Knowledge gained by using these assessment methods now provides a baseline for better understanding the scholarly rigor of previously published pedagogical research conducted by landscape studio educators. In the future, these methods may be shared with allied design disciplines interested in assessing the scholarly rigor of their own pedagogic literature. Continued development and testing of each of these methods may benefit pedagogical research across the design disciplines. I plan to publish these findings and continue to refine the process of assessing the scholarly rigor of pedagogical articles for landscape architecture and allied disciplines. Future work will be shared through international conference proceedings and scholarly papers in the disciplines of SoTL and landscape architecture.

This study may be the first to use Weimer’s classification scheme to assess teaching and learning literature in the discipline of landscape architecture. Based on this study, we now know that Weimer’s classification scheme is an appropriate method of evaluating pedagogical research published in landscape literature. We now know how many qualifying SWOTL articles have been published in the data base examined in this study. We also know how many articles in the data based have reported pedagogical problem-solving activities taking place in the landscape studio. In the future, this information may enable scholars to integrate more pedagogical theory into the studio teaching and learning environment. Understanding what makes robust SWOTL may increase the number of faculty achieving promotion and or tenure based on scholarly output. Weimer’s scheme for evaluating SWOTL literature may become a recognized framework on which landscape studio educators may
build robust scholarship. The new guidelines (found in Chapter 6) may provide studio educators and academic practitioners with new ways of achieving academic recognition and richer learning opportunities for their students.

In the future, my work will likely include assessing other pedagogical journals in allied design disciplines in the United Kingdom and the United States and publishing findings. This may include continued collaboration with colleagues in other disciplines examining pedagogical research articles published in the Journal of Architectural Education, Journal of Interior Design, Design Studies and others. I also plan to share aspects of Weimer’s SWOTL that resonate with faculty in the discipline of landscape architecture at conferences in the United Kingdom and the United States.

Another significance of this study was the use of Groat and Wang’s descriptions of seven architectural research methods. These descriptions provided a way to identify and catalog the use of non-pedagogical research methods by educator-authors conducting scholarly work on teaching and learning in the landscape studio. In this way, a relationship between Weimer’s subcategories of SWOTL literature and Groat and Wang’s descriptions of seven architectural research methods was identified for the first time. Evidence was found to indicate that practice-based methods of research had been used to generate pedagogical research on problem-solving activities taking place in the landscape studio. This was a secondary, but significant finding to arise out of this study. This is an issue that has been rarely discussed in the landscape literature and one that frames the rigor of generating new pedagogical knowledge because the questions and methods of conducting practice-based research are often misplaced or not a robust ‘fit’ for conducting pedagogical research. Studio educators think that they know how to conduct research in the studio (especially on problem-solving topics) and adapt practice-based methods for educational purposes. But the results are not predictable. This line of inquiry may be followed in future work. I can imagine surveying fellow studio educators and academic practitioners to gain more understanding about the practice-based methods of research they have found useful in teaching studio courses. Further study will be required to understand how this relationship might strengthen studio-based pedagogical research in coming years.

This study examined the academic articles in data set 1 for the specific purpose of cataloging all problem-solving tools, techniques and theories recommended by landscape studio educators as having educational value. This was the first time such a comprehensive assessment was made of this topic. Twenty-two different problem-solving approaches were identified. Findings may now be used to advance the body of problem-solving knowledge in
the discipline of landscape architecture and perhaps in interdisciplinary design studios. I have presented some of this information in Cardiff, Wales, at the 4th Annual Research Student Symposium of AHRA PG where the information was well received and I look forward to mining the data of this study for more presentations and papers.

Finally, this study found that landscape students appeared well prepared to address a range of complex cultural and environmental problems. This finding was based on a multi-method assessment of student-preferred approaches to problem-solving. Students preferred twenty of the twenty-two problem-solving approaches educators claimed held educational value. This is significant because few, if any, studies have cataloged pedagogical problem-solving activities from students’ point of view. Further study will be required to understand how students develop a preference for particular problem-solving approaches – especially methods of solving problems that appeared unique to students, e.g., not found in the academic articles.

I currently teach Introduction to Landscape Architecture Studio and Senior Capstone Studio at Mississippi State University. I have the opportunity to study first-hand how students acquire problem-solving tools, techniques and theories. I will be collaborating with fellow faculty to develop and document curriculum intended to teach students basic hand-drawing and computer aided design over a two-year period. The crux of this pedagogical effort involves faculty and students keeping daily sketchbook entries. A scholarly paper is planned to be submitted to the 2018 National Conference on the Beginning Design Student. Upon reflection, I have transitioned from an academic practitioner with the desire to become a contributing academic faculty member to a contributing scholar in landscape architecture.

5.7 Limitations of this study

5.7.1 Data set 1
Data set 1 was limited to three English print landscape architecture journals. Publishing dates were between 1997 and 2008. Articles’ topics were limited to studio-based pedagogical problem-solving activities. Research methods did not provide a way for gathering additional information through conversations with authors of the articles. Nor did examination of articles take into account interdisciplinary work being published in journals outside the discipline of landscape architecture, in practice-based conference proceedings, or through online discussion groups.
5.7.2 Data set 2

Data set 2 was gathered from four cohorts of students. An attempt was made to gather a sufficient sample size (n=29) for educational research, but due to the average class size (n=17) this was not possible. It would therefore be good to repeat the research questionnaire at a different school. Gathering data from only two schools presented another limitation, e.g., results reflected the pedagogical philosophy and characteristics of faculty in only two departments. Limited time and funding did not allow for longitudinal tracking of students. Gaps in research provide opportunities for further research. The design of the study did not allow pursuit of gaps related to teamwork, innovation, frustration of theory, to name a few. These will be issues for another study.
6 Guidelines for preparing academically rigorous pedagogical research for publication

6.1 Overview of the Guidelines
New guidelines have been prepared by the researcher based on evidence from SoTL and on the findings from this study. They may be used in preparing academically rigorous pedagogical research for publication. The template may be used in anticipation of starting a new studio-based pedagogical research project or reworking an existing scholastically weak research article. A template and checklists provide guidelines to assist authors (studio educators and academic practitioners) when gathering background material and developing scholastically rigorous pedagogical research schemata. The template may be used during the literature review to help identify a gap or trend in existing research. It may also be used to assess the scholarly rigor of articles gathered during the literature review process. The checklists may be used to determine appropriate research methods or invigorate the scholarship of existing research: the goal being to conduct research on teaching and learning in the landscape studio that is worthy of publishing. The template and the checklists apply the same methods examined and used in this study.

6.2 Template for recording attributes of published research under consideration
This is a template for recording attributes of articles and text you will be reviewing as you start planning a pedagogical research project. The template will continue to be a valuable document well into writing up your research. This template does more than record your literature review. Utilizing this template assures that your new research builds on established SoTL principles, represents a range of opinions from within the discipline of landscape architecture and explores research published in affiliated disciplines based on SWOTL criteria. Tracking key words and concepts is a way to build consensus on any topic or discover a gap in the literature. The template assures that patterns and relationships amongst key words are easily identified so they may be addressed through your new research. It is also important to determine the scholastic rigor of the journal articles you are citing. Weimer’s classification scheme is valuable in this regard. Completing the template may aid you in selecting an appropriate research method for your studio-based project and may provide examples of successful publications for you to emulate when it is time to write up your findings and submit your work for publication. A sample template is provided below. It is designed to fit an Excel spreadsheet.
### Table 47 Template for recording attributes of published research under consideration

<table>
<thead>
<tr>
<th>Title of Article</th>
<th>Abstract</th>
<th>Vol, Iss, Pg #</th>
<th>Date</th>
<th>Key word</th>
<th>Type of review</th>
<th>Author’s Discipline</th>
<th>Rigor of research based on author’s stated reason(s) for writing the article (Weimer)</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>Fill in new entry</td>
<td>Upload abstract</td>
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<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

- **Start by filling in the template even before your research topic has been formulated.**
  The titles of articles you select will begin to define your research focus. Save a copy of each article or text by the author’s last name in a digital file or as a hardcopy. If you are using an Excel spreadsheet, you may upload a copy of the abstract and insert it in the cell marked Abstract.

- **Citations must be recorded for each article you review.** Volume, issue and page numbers come in handy when it is time to manage references and build a bibliography. Be sure they are complete. Record the publisher, if you are saving information from a paper document. Record URL and date of download, if you are saving information from a Web site. This data collection may be completed by a research assistant or co-author.

- **The date is important for framing arguments, following a line of previous discussions, or understanding how a topic has changed over time.** Dates help connect ideas through conference proceedings, Web sites, dissertations, journal articles, book chapters and books.

- **Key words are often listed immediately following the abstract in a journal article.** Key words may also be identified by reading the abstract and full text, then synthesizing key concepts. In many articles the conclusion section is rich with key words. When you find an especially relatable research project, track down and read the articles listed in the reference section of that article or text. Remember conference proceedings are a good place to find current pedagogical research topics, both in landscape architecture and in the scholarship of teaching and learning literature. [You will need to add more Key Word columns to this template.] Key words will need to be sorted and consolidated as part of the process of determining the research topic. You will start to see a pattern of interesting topics after collecting twenty or more key words. Key words are a great way to identify
gaps in the literature or see topic trends over time (sort by date). Consolidate key words. One to three key words may be enough to begin to frame your argument.

- Examine the quality of each journal or text to determine the type of review the article has undergone prior to publication. Was the article peer-reviewed or blind reviewed? This type of review is typically robust. Was the article self-published or published through an open submission process? An un-vetted review may be scholastically weaker. [This does not mean that the research methods or outcomes are weak, only the review process prior to publication.] This type of information will help you determine the scholastic rigor of each article or text and, to some extent, the value to be placed on the article’s findings. Remember also that conference proceedings provide great material on which to build your pedagogical research. This includes your experience as a presenter undergoing peer review.

- Indicate the author's discipline. Rigorous research builds from within the discipline of landscape architecture. Rigorous pedagogical scholarship borrows from SoTL work conducted by CFAT. Studio-based scholarship shares common characteristics with allied disciplines. In this time of interdisciplinary collaboration, new research benefits from sharing knowledge from and with allied design disciplines, education, the arts, environmental science, and social and cultural sciences. Weimer suggests including several articles authored by scholars outside your primary discipline to assure your work is scholastically robust and transferable across disciplinary boundaries.

- Depending on the nature of your topic, the location of research may be important. Add another column to the template, if this is so. Replicating a pedagogical research project in a new location, in a different climate or with another population is another way to generate scholastically robust research.

- Identify the author’s stated reason(s) for writing his or her article based on Weimer’s checklist of seven topics she considers to be the most common reasons for publishing SWOTL literature. According to Weimer, the most scholastically robust reasons for publishing are to make a significant contribution, to announce a new discovery or to respond to another article. Identify scholastically robust articles and mark each box appropriately. Multiple check marks may indicate a scholastically rigorous article or one you may want to use as a model when designing your new research project. The more articles you gather having strong reasons for being authored, the greater your chances for collecting articles from which you may generalize basic premises to build new research.
The checklist below indicates seven of the most often mentioned reasons an author states for writing a scholastically robust pedagogical research article.

6.2.1 **Checklist of topics indicating rigor in SWOTL literature**

1. Authors’ point of view
2. Transfer findings to reader
3. Challenge for the future
4. Reporting a paradigm shift
5. Condition of funded study
6. Making a significant contribution or announcing a new discovery
7. Responding to another article

Maintaining a template like this will help to frame new research, select an appropriate pedagogical research method, track citations and later, identify appropriate journals to approach for publication.

6.3 **Checklist for identifying topics known to support SWOTL literature**

This is a checklist based on Weimer’s research indicating certain topics known to support SWOTL literature. This checklist has been augmented by suggestions from landscape architecture journal editors and scholars interested in conveying pedagogical problem-solving knowledge beyond the landscape architecture studio. Review this checklist when sorting your key words or looking for topics for further research, as these are topics that are generalizable, replicable and transferable; all attributes of robust research.

The following checklist may help you define the focus of research that is going to take place in the landscape architecture studio. More robust research will incorporate several of these topics and, at the same time, link your new research to previously published studies. Reviewing this checklist of topics may open up many opportunities for more academically rigorous research in pedagogy.
6.3.1 Checklist for identifying topics known to support SWOTL literature

1. Problem-solving
2. History
3. Service-learning, applied
4. Criticism, Evaluation
5. Research
6. Creativity
7. Imagery
8. Collaborative learning
9. Pedagogy
10. Politics
11. Design Methods
12. Design Theory
13. International Design
14. CAD/computers

Below are examples of how these topics might support more scholastically robust results for a Study Abroad trip.

1. Problem-solving – involve students in organizing the trip
2. History – focus on the history of the site(s) you will be visiting
3. Incorporate a service-learning component into the trip
4. Criticism, Evaluation – have students evaluate their experience pre and post trip
5. Research – encourage undergraduate and graduate level research
6. Creativity – find a creative way to document your students’ creativity and then publish the work as Promising Possibilities literature
7. Imagery – expand the definition of imagery to include all senses
8. Collaborative learning – arrange for two-way learning opportunities, cross-list the trip with a non-design discipline
9. Pedagogy – be purposeful in your teaching expectations
10. Politics – consider how current politics shapes your students’ study abroad learning experience
11. Design Methods – base your design methods on a scholastically robust report from a similar site, trip or topic

12. Design Theory – test new theories or reexamine previously published theories in light of your Study Abroad trip

13. International Design – take advantage of studying abroad by visiting practicing local landscape architects and schools of design

14. CAD/computers – Take advantage of the fact that students feel connected to the World Wide Web regardless of their Study Abroad location. This makes it easy for you, as an educator, to extend pedagogical problem-solving knowledge beyond the landscape architecture studio. On any inclement afternoon, you and your students may take a virtual Study Abroad trip floating down the Venice canals reminiscing about Lynch’s wayfinding pathways, edges and nodes.

With these fourteen points in mind, a trip that normally might have been written as a discipline-dependent case study, recommended practice report, or a personal narrative, may now be developed into a more scholastically robust article focused on topics proven to cross disciplinary boundaries and generate discussion as SWOTL literature.

6.4 Checklist based on Weimer’s classification scheme for SWOTL literature

This is a checklist for assuring that the author uses a style of pedagogical research known to result in robust publishable literature. This will assure new knowledge is generalizable, replicable and transferable to a broader audience than the limited readership of landscape studio educators. This checklist is taken directly from Weimer’s subcategories of SWOTL literature. Following this checklist will assist authors in responding to CELA’s 2008 stated goals for moving research in landscape architecture academic programs and the Landscape Journal “beyond the creation of knowledge by and for landscape architects, and toward greater participation in the broader community of scholars and practitioners concerned with design, planning, and management of the land, are based on these findings” (Gobster, et al., 2010, p. 52).

6.4.1 Wisdom of Practice checklist

Personal Accounts of Change - Use when reporting on experiences associated with implementing an instructional policy, practice, technique, method, or approach. Be sure to report on the implementation of something different or a change.

Recommended-Practices Reports - Use when giving instructional advice about some or several aspects of studio-based instruction.
Recommended-Content Reports - Use when discussing ways of teaching particular aspects of content. Be sure to illustrate what devices should be used in the landscape studio to explain, illustrate, demonstrate, and otherwise support the acquisition of course content by students.

Personal Narratives - Use when relying on your own ideas, share individual opinions, viewpoints, ideas, concerns, or positions. No references or citations are necessary. Use sparingly, as this is typically not a robust form of research.

6.4.2 Research Scholarship checklist

Quantitative Investigations - Use when working on experimental designs that involve treatment and control groups with some manipulation of variables across or between them.

Qualitative Studies - Use when studying phenomena in naturalistic settings and analyzing results interpretively.

Descriptive Research - Use when collecting and analyzing survey data.

6.4.3 Promising Possibilities checklist

Hybrids - Use when combining two or more of Weimer’s recommended approaches to conducting SWOTL literature.

Innovative - Use when you want a method that is very different from anything you have found through your literature review or you want to be especially creative with one of the more established approaches.

Unique Articles - Use when you are presenting material in some unusual way. This may involve multiple sensory receptors or new media formats.

6.5 Checklist for assessing suitable non-pedagogical research methods

This is a list of scholastically robust reporting methods based on Groat and Wang’s definitions of practice-based research. This checklist will assure new knowledge is gathered and presented with scholarly rigor. The researcher recognizes practice-based research methods are sometimes the most convenient or flexible. Used properly, they can be used to conduct pedagogical research.

6.5.1 Non-pedagogical practice-based research methods

1. Case Study
2. Logical Argumentation
3. Interpretive Historical
4. Qualitative
5. Correlational
6. Experimental
7. Simulational
6.6 Summary of the process for preparing academically rigorous pedagogical research for publication

Together, the template and checklists provide a succinct way to increase the probability that new pedagogical research will include scholastically robust characteristics. This goal will be achieved when studio educators and academic practitioners submit academically rigorous pedagogical research to peer-reviewed journals and have their work accepted for publication. This success will benefit the individuals involved, their institutions of higher education, and the body of knowledge held within the discipline of landscape architecture. Ideally, new work will cross disciplinary boundaries to provide generalizable, transferable and replicable knowledge to allied disciplines.
7 Conclusion

This study has shown how multiple assessment schemes used by educational research scholars in the field of scholarship of teaching are suitable for evaluating pedagogical research conducted and published by landscape studio-educators. This study has tested these schemes for determining the scholastic rigor of articles authored by landscape faculty and has choreographed an order in which the data may be effectively sorted. This study has shown the range of pedagogical and non-pedagogical research methods that have been used successfully in the past to conduct and disseminate studio-based problem-solving pedagogical research. This study has shown similarities in the ways landscape architecture students solve studio-based problems, regardless of gender of class ranking in school in the United Kingdom and the United States. This study has shown similarities in the selection of tools, techniques and theories by the landscape architecture students in data set 2 compared to recommendations of similar tools, techniques and theories vetted in the academic articles in data set 1.

This researcher believed that through the act of cataloguing our existing body of pedagogical problem-solving knowledge, we could begin to identify innovative approaches to studio-based teaching and learning that might, until now, have gone unnoticed. Likewise, this researcher believed that studio educators have the power to transform studio education through the publication of robust pedagogical scholarship. In turn, published pedagogical scholarship has the power to impact students in positive ways as they train to be creative problem solvers in the landscape architecture profession. These were the researcher’s beliefs that provided the basis for this study.

Whether more rigorous pedagogical research will be published as a result of this is study or any other study, is not known. What is known is there is now an urgency amongst leading international academic journals to encourage original, scientific and scholarly research. This parallels higher education’s emphasis in scholarship work in research, teaching and service. In the future, understanding the characteristics of scholarly pedagogical research may assist studio educators, especially academic practitioners, interested in strengthening their studio-based research. Guidelines found in Chapter 6 have been provided for preparing academically rigorous pedagogical research.

7.1 Recommendations for improving this study

The following recommendations are offered as possible ways to improve this study. The number of paper journals might be increased and on-line journals included to provide a
broader base of data. Although it is costly, additional landscape studios might be visited and more students invited to respond to the survey instruments. Studio educators might be interviewed about their decision-making process for selecting and conducting pedagogical research on particular problem-solving tools, techniques or theories. Since 2008, increased use of computers has possibly changed the way students and faculty solve studio-based problems. These are areas for further research.

7.2 Future Research
Future research may involve assessing academic articles published after 2008 to determine the scholastic rigor and breadth of more recent pedagogical scholarship. If scholarly rigor can be shown to have increased, this might indicate studio educators have responded to a call made by Gobster, et al., in 2010 to enhance scholarship in landscape architecture. Other gaps needing to be investigated include the issue of teamwork. Notably, teamwork and innovation were recommended by educators in the articles but not considered important by students. Educators recommend the value of working in groups, while students appear to avoid teamwork. Innovation is another educator-recommended approach to project resolution that students do not consider when asked how they go about exploring, or resolving a studio-based problem.

This researcher plans to further investigate the role of teamwork in collaborative or group learning. My pedagogical research will take place in the studio learning environment where I instruct freshman and seniors. There will be opportunities to conduct pre and post preference and aptitude tests, as well as to conduct longitudinal studies following students through four years of collaborative projects.

Then, there is work to be done developing and describing how SoT, SWOTL and MSOT might benefit educators conducting research in the landscape studio. Healey has encouraged teaching faculty to identify the most appropriate ways in which this might be done. This study responded by proposing new guidelines for preparing academically rigorous research in pedagogy. These are found in Chapter 6 of this study. The guidelines may be a way to assist studio-based researchers and begin to address Thwaites’s question; what further evidence do we have that research on teaching and learning has been taking place in the undergraduate studio? An answer may be with robust pedagogical research authored by design studio educators and academic practitioners.
8 Appendices

8.1 Appendix ‘A’: Select Design Journal Articles

These resources were used as references for developing the research questionnaire.

ALTERNATIVES

DS 2007, 27, 5, 499-512, Heylighen, *Less is more original?* Originality correlates positively with alternative solutions to a problem, at the at the cost of producing fewer solutions

HOLD CONTRADICTORY IDEAS


INTUITION/INSIGHT

DS 2003, 24, 4, 313-326 Heylighen, *Close encounters of the architectural kind*, Arch, case-based reasoning, design education, analogical reasoning

JOKE

On-line computer gaming articles


LOGIC/NUMBERS/AHA!


JAE 2006, 60, 2, 4-7 Boza, *(Un) Intended Discoveries: Crafting the Design Process*, Arch machine-tools -- Numerical control, Automatic control, Technological innovations, Industrial productivity and efficiency

NARRATIVE

JID 2006, 31, 2, 10-28, Danko, *Humanizing Design through Narrative Inquiry*, Interior Design narrative inquiry, design methods, design studio


PATTERNS/2-D


DS 2000, 21, 5, 451-464, Rodgers, Paul A. *Using concept sketches to track design progress*, Product Design Engineering, conceptual design, drawing, design process, product design, design representation
PLAY

JAE 2005, 58, 4, 6-11 Cavanagh, For Want of Wind, arch., architectural design, playgrounds -- equipment & supplies, community life, Project method in teaching, Architecture -- Study & teaching


DS 2006, 27, 6, 711-722 Shih, A game theory-based approach to the analysis of cooperative learning in design studios, non-disciplinary focus, design education, collaborative design, teamwork, cooperation

PEDAGOGY


JAE 1997, 51, 2, 94-97, Allen, Second Studio: A model for Technical Teaching, better knowledge acquisition and application, problem-based learning environment, creative design exercises generate need for lectures

LRev, 2002, 8, 1, 12-28, Thwaites, Teaching and Research: An Integrated Approach to the Undergraduate Studio in Landscape Architecture Education, RAE, research, theory

LRev, 2004, 9, 1, 80-85, Corkery, Students' Perceptions of Excellence in Landscape Architecture Studio Projects, studio teaching, design excellence, theoretical framework and concepts of research project

JID, 2004, 30, 1, 1-12, Guerin and Thompson, Interior Design Education in the 21st Century: An Educational Transformation,


PICTURE

LJ, 2003, 22, 1, 37-54, Crewe and Forsyth, LandSCAPES: A Typology of Approaches to Landscape Architecture, problem-solving, intuitive, art, history, environmental, scientific, cultural, public/private

TACIT/SENSES

JAE 2006, 60, 2, 8-17 Dunay, No Compromise: The Integration of Technology and Aesthetics, architecture, industrial design, interior design, landscape architecture, electrical, mechanical, and structural engineering solar technology, solar energy, architecture, sustainable development, technological innovations

TALK PROTOCOL


THINK OF PROBLEMS NOT YET THOUGHT OF
  JAE, 2005, 58, 4, 18-23, Viscardi, *a MATTER of transformation*, architecture imagination, cognition, educational psychology, creative ability, architectural studios

VISUAL-SPATIAL
  Central Saint Martins’ College of Art, Research Centre, The London Institute, 1999, Steffert and Padgett, *Visual Spatial Ability and Dyslexia: A Research Project*

PRESENTATION/DESK CRIT

REFLECTIVE PRACTICE
  DS 2007, 28, 5, 485-497 Jeffries, Karl K., *Diagnosing the creativity of designers: individual feedback within mass higher education*, tested on product and transportation design students but talks about design education in general creativity diagnostics, design education, evaluation, reflective practice (impact of diagnostic feedback)

TEAMWORK
  DS 2006, 27, 6, 711-722 Shih, A *game theory-based approach to the analysis of cooperative learning in design studios*, Non-disciplinary focus, design education, collaborative design, teamwork, cooperation

THREE-DIMENSIONAL/PUZZLE/CAD
  DS 2006, 27, 4, 505-524 Ho, *An investigation of 2D and 3D spatial and mathematical abilities*, industrial design, spatial ability, design cognition, perception, visual reasoning
  DS 2006, 27, 4, 439-455 Peng, *In-situ 3D concept design with a virtual city*, 3D concept design, modeling, virtual reality, system design, Design Ed, urban design

TWO-DIMENSIONAL SKETCHING
  DS 2001, 22, 3, 281-284 Kavakli, Manolya, *Sketching as mental imagery processing*
8.2 Appendix ‘B’: Pilot Survey discussion questions

Below are some of the questions discussed with the pilot study group. These questions were refined and used in the research questionnaire.

1) Do students depend on discipline-specific ways of solving problems or do they search for solutions outside their primary design discipline? [Ask the students, look for evidence in the way they approach the design process, inquire of the wisdom of practice reports.]

2) What theories, techniques or tools do students apply to complex landscape studio problems? [Ask them, ask their tutors and look for evidence in their design work and presentations.]

3) What kinds of problem-solving knowledge do students acquire between their first and final year in design studio? [Ask open-ended questions and look for evidence of differences between first and final year students.]

4) Does a student’s level of technical skill, between the first and final year, influence the way he or she resolves a design studio project? [Look for evidence in students’ work.]

5) Is there a correlation between tactile problem-solving and the gender of the student? [Look for evidence in students’ work.]

6) Of what value is ‘humor’ to the design process? [Query students’ opinions.]

7) How does talk protocol differ from narrative as a generative tool? [Observe students and refer to research in the wisdom of practice reports.]

8) What does a student do if he or she is stuck? [Query students’ to find out what they actually do and research the wisdom of practice reports for advice.]

9) What point in the design process does a student know the solution to his/her problem? [Ask students for examples.]
9 References


Available at: http://www.elseview.com/wps/find/journaldescription.cws.home/30409/description#description
[Accessed 8 May 2010].

Available at: http://design.open.ac.uk.cross/DesignThinkingResearchSymposium.htm
[Accessed 9 5 2010].


Available at: http://www.kentucky.com/2012/04/09/2144439/tom-eblen-interior-design-is-largely.html
[Accessed 17 July 2013].


[Accessed 1 July 2013].

Kinsey, G. et al., 2006. The Transition from Practitioner to Professor: The Struggle of New Faculty to Find their Place in the World of Academia. s.l., Faculty Publications and Presentations, Paper 118.


9.1 End notes

i Article also published in Landscape Design Extra, 2001.

ii A recent research study found (n=174) SoTL articles drawn from a possible 816 SoTL articles published between 1999 and 2010 in three well-known academic design journals (Design Studies, Journal of Architectural Education, and Journal of Interior Design) or 21% possessed characteristics of promising possibilities literature.

iii Brown and the researcher were presenting papers at the 6th Annual Architectural Humanities Research Association (AHRA) Research Student Symposium, Cardiff, Wales, in December, 2009.

iv Boyer’s wife taught nursing. Following his death, she became a proponent of SoTL and helped changed the way professional nurses are trained in the United States.

v Schön spent his academic life at MIT exploring of the nature of learning systems and the significance of learning in changing societies. From 1968 to the mid-1990s, he was Ford Professor of Urban Studies and Education, Chair of the Department of Urban Studies and Planning, and later became Ford Professor Emeritus and senior lecturer in the School of Architecture and Planning.

vi Notes from LA 540 Graduate Seminar lecture given by Dr. David Wang, Washington State University, 27 January 2004.

vii A key note speech presented by Rolf Johansson at the International Conference “Methodologies in Housing Research” organized by the Royal Institute of Technology in cooperation with the International Association of People–Environment Studies, Stockholm, 22–24 September 2003.

viii George E. Walker served as senior scholar and director of The Carnegie Initiative on the Doctorate, a five-year partnership of 106 doctoral-granting departments, from 2000 to 2005.

ix This article, The Refereed Studio: guest editorial, was reprinted in the United Kingdom as ‘Researching the Studio’ (Berger, Corkery and Moore).

x Chair Group Landscape Architecture, Wageningen University, The Netherlands

xi The researcher spoke by phone with Beverly Steffert. She sent the researcher samples of useful survey questions, fall 2006.

xii The researcher met Edward de Bono at the Dyslexia Scotland Conference in Glasgow, September 2006. He was the featured speaker.

xiii Margaret Bryant, e-mail correspondence, State University of New York College of Environmental Science and Forestry on 24, May 2013.

xiv Paul Selman served as editor of the journal Landscape Research between 1993 and 2003.

xv M. Elen Deming was co-editor of Landscape Journal with James F. Palmer.