Developing online content for foundation design instruction

Submitted to the UNC Charlotte Scholarship for Teaching and Learning Grants Program

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Abstract

Foundation design studio (first year) in the School of Architecture introduces essential representational skills and design concepts through a rigorous sequence of hand-drawing and modeling exercises. In particular, first year emphasizes the use of 2D and 3D diagramming as an aid to understanding and generating designs. This proposal seeks to investigate the use of interactive online content to help teach architectural diagramming more effectively.

To support and supplement in-studio demonstrations of diagramming methodology, the instructors have already created over 2,000 original high-resolution images and one hundred-fifty digital models. Although students have access to these materials online, in practice, the use of static media is less than ideal to convey nuances of manual technique and theory. Our goal is to translate this media into animated and interactive online content that we believe will increase accessibility and facilitate improvement in skills performance and subject comprehension.

We propose a pilot study to study the effectiveness of online content and determine the feasibility of translating all of our lessons into this format. Our plan is to convert a sampling of lessons into interactive media and then to evaluate them by comparing student outcomes against previous work that does not use the updated material. Longer-term, our intention is to build upon this proposal and seek additional funding to develop a new framework for teaching and learning the fundamental principles and practices of design.

Budget Request for SOTL Grant
Year 2012–13

Joint Proposa ? X Yes ____ No

Tit e of Project: Deve oping Animations for First Year Architecture Core Curricu um

Duration of Project: May December 2013

Primary Investigator(s): Jeff Ba mer Nick Senske Michae Swisher

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UNC Char otte SOTL Grants Previous y Received: None

A ocate operating budget to Department of: Schoo of Architecture

		Year One
Account #	**Award**	**January to June**
Faculty Stipend	Transferred directly from Academic Affairs to Grantee on May 15 (3 x $1000)	$ 3000
911250	Graduate Student Salaries (2 x 8 weeks x 40 hours @ $10/hr)	$ 6400
911300	Special Pay (Faculty on UNCC payroll other than Grantee)	
915000	Student Temporary Wages	
915900	Non-student Temporary Wages	
920000	Honorarium (Individual(s) not with UNCC)	
921150	Participant Stipends	
925000	Travel - Domestic	
926000	Travel - Foreign	
928000	Communication and/or Printing	$ 100
930000	Supplies	
942000	Computing Equipment	
944000	Educational Equipment	
951000	Other Current Services	
	GRAND TOTAL	$ 9500

Attachments:

1. Attach/provide a narrative that explains how the funds requested will be used.

2. Has funding for the project been requested from other sources?
   (See Narrative)

Budget Narrative

The primary expenses for this research are personnel costs. Professors Swisher, Balmer, and Senske will each be compensated $1,000 for their work designing the online content, conducting the student testing, and analyzing the data. In addition, funds from this grant will be used to hire student personnel to assist in the conversion of course materials. $6,400 will cover the costs of training and labor for two students (320 hours each at the graduate student rate of $10 per hour) who will covert materials and implement a test website. A small allocation for printing and copies will allow us to distribute the test instrument to students.

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7 November 2012

Scholarship of Teaching and Learning Grants Committee
Center of Teaching & Learning
Atkins 149 C
UNC Charlotte
9201 University City Blvd.
Charlotte, NC 28223-0001

"Developing Online Content for Architecture Foundation Design":
Faculty Collaborators: Michael Swisher, Jeffrey Balmer, Nick Senske, School of Architecture

Dear SOTL Grants Committee Members,

I write this letter of support for the Scholarship of Teaching and Learning grant application by School of Architecture faculty members: Assoc. Prof. Michael Swisher and Asst. Profs. Jeffrey Balmer and Nick Senske. The main thrust of this proposal is the "translation" of instructional materials from analog diagrams to digital tools for beginning design instruction.

Profs. Swisher, Balmer, and Senske have developed a unique pedagogical system – recently published by Routledge Press (London, UK) – which presents teaching methods through diagramming techniques. In this case, diagrams are used as "shorthand" for compositional, systemic, technique-driven design skills that enable complex form analysis and synthesis. These tools represent a "writing across the curriculum" approach that emphasizes communication and transliteration as learning outcomes. Previous work by this team has resulted in major presentations at international conferences focused on pedagogy, beginning design education, and publication.

Profs. Balmer and Swisher co-authored the book, "Diagramming the Big Idea: Methods for Architectural Composition," and Prof. Senske has developed new digital approaches to the curriculum. This grant will permit the integration and synthesis of two major threads of curricular development developed over the past 6-10 years to combine digital methods with foundation design education.

The idea of this effort was spawned when the authors co-directed the 2010 National Beginning Design Student Conference (hosted by the UNC Charlotte School of Architecture), and was further developed in presentations by the faculty to the university's "Communication Across the Curriculum" workshops, along with internal course evaluation and invitations to international lectures. One strong goal of this digital "translation" is to increase access to the core instructional sequences that online education would permit. This is an area of architectural education eschewed by more traditional, mentor-focused educational methods, and yet proven in many other disciplines to increase retention and practice rituals.

I endorse this project without reservation. The materials that Profs. Swisher, Balmer, and Senske will compile will have a significant impact not only on UNC Charlotte, but also the fields of Beginning Design and Architecture across a wide range of institutions.

Sincerely,

Ken Lambla

Ken Lambla, AIA
Dean / College of Arts + Architecture

Project Narrative

The purpose of this research is to learn more about how to design online content for architectural education, and to measure the effectiveness of this content upon student learning outcomes. With this project, we hope to better understand how technology can deliver studio content more efficiently while improving accessibility for students.

Project Objectives

1. To convert existing course content into animations and interactive media for online distribution,
2. To conduct design research into best practices for creating such content and integrating it with studio pedagogy,
3. To initiate a pilot study to determine if online content has a positive impact on student skills and comprehension in design studio,
4. To disseminate our findings to our department and to architectural education conferences and journals.

Research Questions

Research questions to be answered include:

1. **How should foundation design instructors translate existing course material for online consumption?**

   We know from our background research[1] that animated and interactive materials are only effective if they are designed in accordance with cognitive learning principles. How to do this, within the context of architectural diagramming instruction, is a research question we hope to answer.

2. **How should foundation design instructors integrate the online material with their pedagogy?**

[1] See the literature review, in a later section

Our background research also revealed that pedagogy is a critical factor in the effectiveness of animations and interactive material for student learning. Studying the role of this media in relation to our class lectures and exercises, and how it should be prompted and delivered online so it connects with in-class activities, is another aim of our proposal.

3. **Do animations and interactive materials lead to improvements in first year students' learning outcomes?**

   The most important research question in the proposal is to determine to what extent the new online materials can help our students perform better in our foundation design studio lessons. Specifically, we plan to evaluate students' diagramming skills (for example: the quality of students' drawing construction) and diagram comprehension ability (for example: being able to report if a composition is aesthetically balanced).

Rationale

Most models of architectural learning derive from a legacy of the master/ apprentice relationship with its origins in atelier or workshop practice. As a result, teaching and learning in the studio is highly interpersonal and hands-on, with considerable contact hours compared to other types of courses. While this kind of instruction is essential to training representational skills and design thinking, students also need access to supplemental resources to assist them with review and self-remediation outside of the studio. In our first year design studio, these resources entail a considerable amount of visual and written information. The first semester alone comprises over 2,000 original high-resolution images and one hundred-fifty digital models, all of which are available online.

This large amount of supplemental material is necessary because the majority of our lessons involve step-by-step descriptions of design exercises. While helpful to our students, these resources are currently suboptimal for students' needs. We believe that sequential images do not communicate our lessons as well as they could in other media. Breaking down techniques and conceptual explanations into visual steps and writing can remove a sense of fluidity and comprehension of the task as a whole. As exercises of design and craft, there are nuances and

steps-between-steps that are not quite captured by sequential stills or even video. Moreover, in these formats, students experience the material as a passive experience when active learning is more appropriate.

Therefore, we propose upgrading our teaching materials from static sequential media to narrated animations and interactive media. With SoTL funding, we would make these improvements and then study their impact upon our students. Our goal is to produce rich online content that functions less like passive instruction manuals and more like what our students experience in studio: a hands-on master / apprentice approach that makes them active participants in their professional, creative, and intellectual development.

Impact

We feel this project has implications, not only for our program, but for other schools of architecture seeking to adapt instructional traditions to changes in technology and learning patterns. If successful, the learning materials we create will enable us to deliver our course content in a more efficient manner, which will allow us to cover topics with greater depth than before. Furthermore, by allowing students access to different modalities that they can control at their own pace, our lessons can adapt to different learning styles. Lastly, by assessing student outcomes, this research will help schools (in particular, our own) determine whether upgrading their studio materials justifies the potential development costs.

Literature Review

Our study will focus on producing online materials for lessons involving architectural diagramming in 2D and 3D and the interplay between these representations. Diagramming, which is used to both generate and analyze designs, is an essential skill for architects (source). As such, it is one of the most important topics taught within foundation design studio. Unfortunately, there are few resources available that demonstrate how to construct and interpret diagrams. Existing examples include (Young, 2011; Clark and Pause, 2007). Notably, none of these has an online component. One of the difficulties of producing instructional materials to teach diagramming is the number of figures and images required to explicitly and comprehensively describe the diagramming process. For instance, our own book (Swisher and

Balmer, 2012) on diagramming contains over 5,000 individual images. As such, we believe that diagramming is a prime candidate for animated and interactive media.

In architecture, the use of instructional animations has been limited to teaching building technology topics such as structures and environmental systems. Anecdotally, animations have improved student engagement with the material and helped some learners master difficult concepts. In the design studio, which tends to be and hands-on and critique-based, we could find no examples of their use for teaching drawing and comprehension.

However, there is a considerable body of research concerning teaching and learning with animations in other educational subjects. For instance, in math, the sciences, medicine, and computer science. In general, it has been shown experimentally that animations can improve student learning in specific circumstances (Meyer and Moreno, 2002). More relevant to our own research, we found evidence that animations are superior to static graphic sequences when applied to teaching motor-skill tasks such as folding paper, geometric construction, and handwriting (Wong, et al 2009). This would seem to apply to diagramming, which gives us confidence in our research proposal.

It is important to note, however, that merely introducing animations is not sufficient to improve learning. In fact, some studies have found animations to be harmful to student's performance. The differences in outcomes are thought to stem from how the animations are designed and how they are used in class. For example, factors such as the speed of the animation, the tone of the narration, and the positioning of labels can affect how well students make use of animations (Meyer and Moreno, 2002; Hoffler, T. N., & Leutner, D., 2007). In addition to design factors, pedagogical factors are also important. One problem with the way students learn animations on their own is that they will focus on the wrong details and fail to create coherent generalizations. To prevent this, learning has to be structured and guided to support animations, so students can process information needed to make use of them. Towards this end, we are interested in studying how to format and teach with the animations in the context of architectural studio. Determining best practices for diagramming animations would be useful information for other instructors and is vital if we are to ensure their effectiveness of the animations in our study.

Methods

We propose a pilot study to translate a select group of preexisting lessons from static media into interactive online content and then to measure their effectiveness upon learning outcomes in foundation design studio.

Professors Swisher and Balmer are experts in design pedagogy, and have recently published a book on architectural diagramming. Together, they have several years' experience teaching it in first year. They will design the online media component, deliver the test instrument to their students, and evaluate the students' diagrams. Professor Senske teaches digital media in the school of architecture and has published papers on digital media pedagogy. In addition, he has training in research methods. He will train and supervise the student personnel to convert the diagramming lessons and assist in the creation and analysis of the test instrument.

This winter, we will write the test instrument, which is a multiple-choice quiz derived from the concepts taught in first year. Students will be shown a series of diagrams and are then asked to interpret them in terms of design concepts from first year (e.g. balance, proportional order). We will validate the instrument in consultation with first year instructors for other institutions.

The current class of students will be our control group. The test instrument will be given to students this year and their diagrams from the first semester will be collected as base cases for later assessment. We are using this group and diagrams produced earlier in order to compress the time frame of the research to under a year.

In the summer, our plan is to work together with student personnel to translate our collected diagramming resources into animations and interactive media using Adobe Flash. These media will demonstrate the actual construction of diagrams, including the direction of line drawing, line weights, labeling, and commentary by the instructor. In addition, we will construct a website to host and display our media. Students will be able to skip to specific lessons and subheadings within the lesson. They will also be able to control the pace of the animation, rewind them, etc.

Also over the summer, we will research the use of animations in education and revise our curriculum to make better use of them.

The fall class will be our experimental group. They will be asked to produce the same diagrams as the control, but with access to the online media and having followed our modified pedagogy. These diagrams will be collected and students will be given the test instrument.

Both sets of diagrams will be scored according to a common rubric already used in our course. The scoring will asses attributes such as clarity and order, which are important to architects but admittedly are not easily quantifiable. We recognize that this is not a very rigorous method compared to other kinds of data collection. However, our quasi-experimental design is a necessary evil because what we want to measure in this case is subjective. We argue that, among architects, there are common standards of appreciation and composition. We can say whether something is done well or is not and to what extent and be confident that our colleagues would say the same. In the discipline, there is agreement that good diagrams display the presence of either rational order, or unresolved order. Bad diagrams remain ambiguous or unclear in their discovery. We thus can measure or appraise their clarity in a way that is relevant to the research objectives.

After the data has been collected, we will analyze it using basic statistical methods, in consultation with the School of Education. Then we will compile a report and begin working on a manuscript for conference submission.

Evaluation

We will use two principal means of evaluating the relative effectiveness of the supplemental animated and interactive curricular content. These consist of 1.) base-case tests and 2.) a test instrument. Evaluation will be given to both the control and experimental groups following three skill-based assignment sequences, which are assigned throughout the semester. The base-case tests are diagrams completed for a specific assignment, which are collected and archived by the instructors. The test instrument is a multiple-choice quiz designed to assess how well students can discern design ideas such as contrast, balance, and proportions, when observing diagrams.

The three first-year project groups each use architectural diagrams as part of their explicit teaching/learning tools. As understood in design practice, these diagrams make both (student)

intent and analysis visible rather than implied and therefore, open to evaluation metrics. The diagrams will be collected by instructors and scored in terms of line quality, construction, order, and clarity, among other metrics. While these concepts are admittedly subjective and difficult to precisely quantify, the professors have several years' experience assessing student diagrams and have developed a consistency of measurement between them. Although this could introduce some bias, as the principle investigators are also the instructors, they are the most qualified personnel we have to accomplish both roles. We hope that there is a significant enough difference in performance that we can attribute it to the online materials and not due to our testing methodology itself.

The diagrams will be scored according to a preexisting grading rubric and recorded for further analysis. Using the rubric will allow us to make comparisons to previous classes, should we decide to do so. The goal of this evaluation is to see whether student work improves as response to exposure to the online media. We would expect to see improvement and measuring it against the rubric we already use for grading makes sense to us. If animations could be said to improve students' grades, this would be a positive result.

The test instrument will be calculated as a simple-multiple choice scoring system. We will compare the correct answers to collect our data and render analysis. With the test instrument, we hope to measure if students' conceptual understanding of diagrams is improved by the online materials. We are interested in this because one of the problems of online media is that it benefits procedural skills but sometimes at a cost of conceptual learning. If we can design the media and pedagogy so that students can interpret diagrams better after exposure to them, this would be a positive result.

Knowledge Dissemination

We first plan to communicate our findings to our department, during a faculty meeting and/or colloquium presentation. In addition, a conference paper will be prepared and submitted to the *National Conference for the Beginning Design Student*. Other venues could include the Association of Collegiate Schools of Architecture (ACSA) and the Architectural Research Centers Consortium (ARCC) conferences. With further research, this project could be a candidate for a submission to the *Journal of Architectural Education*.

Human Subjects

Since the research will occur within an existing instructional and pedagogical context, we plan to apply for a waiver of consent. We will submit the waiver by the end of this school year.

Extramural Funding

No external funding is being sought for this proposal. However, once we complete the pilot study, we plan to use our findings as the basis for applying for a FIPSE (Fund for the Improvement of Postsecondary Education) grant when they become available. The FIPSE Comprehensive Program is a particularly apt venue for our continuing research, as it aims to stimulate innovation in areas that related to student learning, curricula reform and institutional change.

Timeline

January 2013	Study and design of online content
May 2013	Implementation of online content with student assistants; Collection and cataloging of control group materials
September 2013	Initiation of pilot study with experimental group lessons; Collection and cataloging of experimental group materials
November 2013	Conduct analysis of collected student work and research instrument; Preparation for extramural conference presentation and publication.
Spring 2014	Disseminate findings at conference presentations

Works Cited

Balmer and Swisher (2012). Diagramming the Big Idea: Methods for Architectural Composition. Routledge.

Clark R. and Pause M. (2000). Precedents in Architecture. Wiley.

Hoffler, T. N., & Leutner, D. (2007). Instructional animation versus static pictures: A meta-analysis. Learning and Instruction, 17, 722-738.

Meyer and Moreno (2002) . Animation as an Aid to Multimedia Learning, Educational Psychology Review, Vol. 14, No. 1, 87-99.

Young, P. (2011). Architectural Diagrams. Dom Publishers.

Wong, A. et al. (2009) Instructional animations can be superior to statics when learning human motor skills, Computers in Human Behavior, Volume 25, Issue 2, 339-347.

Appendices

Part one: First-year studio & skills project sequence

Images from handout

Part two: Studio assignment A1

Images from handout

Part three: Studio assignment A5

Images from handout

Part four: Studio assignment A27

Images from handout & lecture

Part five: Principal investigators

Biographies

Remarks:

We include in the appendix the assignment lists for both Studio & Skills class for the first semester (ARCH1101 & 1601). This we follow with examples of the visual materials for the three assignments that will be the site for the proposed new course materials.

The final appendix contains brief biographies of the three principle investigators for the project.

Appendix

Part one: First-year studio & skills project sequence

Assignment & group structure: ARCH 1101 & 1602 – first semester, first year*

Project list for 1101 Studio

Group One
- A1-line & ground †
- A2-figure & ground
- A3-figure & field
- A4-figure & 2 fields

Group Two
- A5-4×6#1
- A6-add field †
- A7a-group & add box
- A7b-copy relief 1
- A8-ground grain & group
- A9-group relief
- A10-axon cards
- A10b-figure redo
- A11-field redo
- A12-section & elevation
- A13-plan layers
- A14-new relief
- A15-perspective views
- A16-plan & section
- A17-review questions

Group three
- A18-3 figures & grids
- A19-spatial models
- A20-grids & walls
- A21-diagrams
- A22-points & lines prep
- A23-points & lines 1
- A24-points & lines 2
- A25-diagram model #1
- A26-three diagram models
- A27-5 diagrams †
- A28-model fragment
- A29-large model
- A30-final model
- A31-studio (w)rap
- A32-studio disc

Project list for 1601 Skills

Group One
- Introduction
- A1: Drawing Lines
- A2: Key Outline
- A3: Filled Key
- DD1: Drawing lines
- IC1: Journal Lecture and Assignment

Group Two
- A4: Grayscale key
- DD2: Edgeline, photographs and minimal drawing of ground
- A5: Rock outline
- DD3: Edge/line + shaded form, from picture
- DD5: Common ground, Landon NYC lecture
- A6: Rock with tone
- DD: 4 Viewfinder lecture (includes 12 images of flat surfaces in the school)
- IC2: Scanning Demo and assignment
- A7: Skills disc assignment, Midterm
- DD5: Viewfinder 2, on their own in the school

Group Three
- A8: Viewfinder with perspective, SOA halls
- DD6: Charles Moore
- A9: SOA halls perspective 2, Michael's lecture
- DD8: Tabletop and domestic landscape
- IC3: Still Life 1
- DD9: Space between (kitchen photographs and lecture)
- IC4: Still Life 2
- A10: Photoshop Instruction
- DD10: Morandi line drawing
- IC5: Still Life 3
- A11: Photoshop Instruction
- DD11: Morandi etching, introduction
- IC6: Still Life 4
- DD12: Giacometti
- IC7: Still Life 5

These two columns show assignment lists for both the Studio and concurrent Skills class illustrating their structure. Projects marked with a cross (†) indicate assignments planned as location for animated online materials implementation.

APPENDIX

Part two: Studio assignment A1

Images from handout

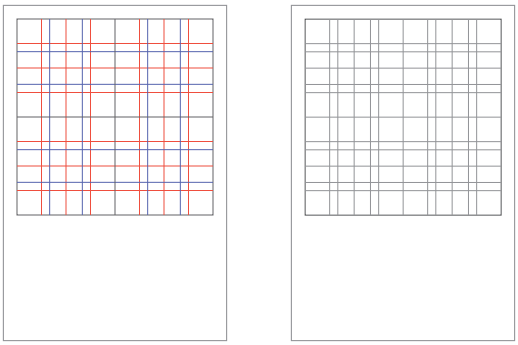


Figure 1: The underlying tartan grid, shown as two colors and as a monochrome construction.

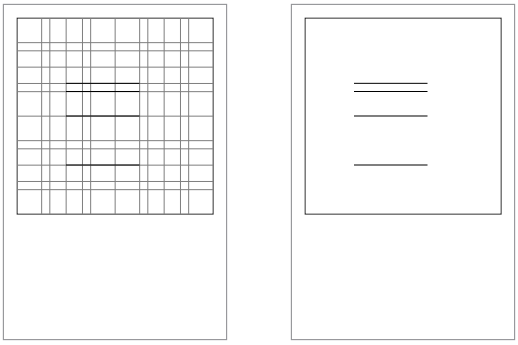


Figure 2: Four horizontal lines with parallel edges shown with & without construction grid.

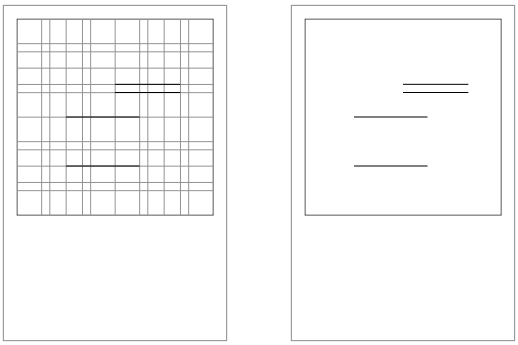


Figure 3: Staggered figures drawn as paired lines, shown with & without construction grid.

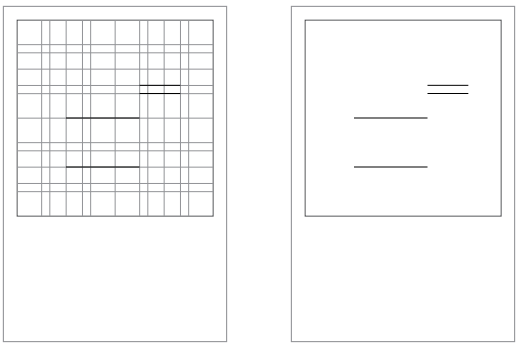


Figure 4: Edge-aligned figures drawn as paired lines, shown with and without construction grid.

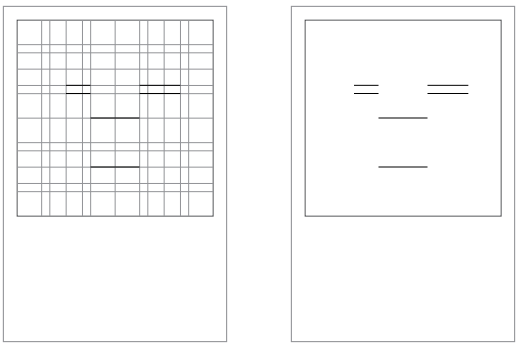


Figure 5: Fitted figures drawn as three paired lines, shown with and without construction grid.

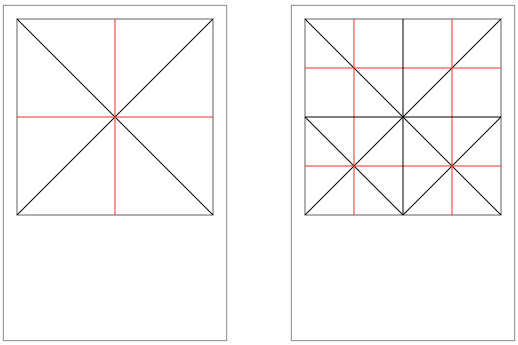


Diagram 6 a–d: Drawing the grid, construction for halves, fourths & eighths – *above & below.*

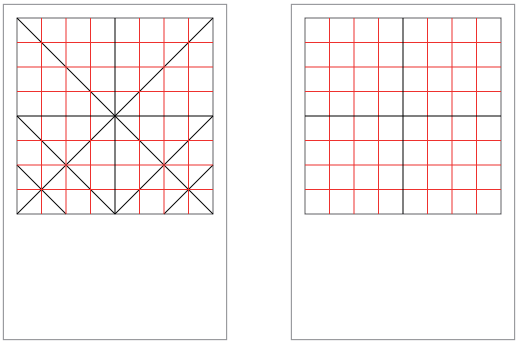
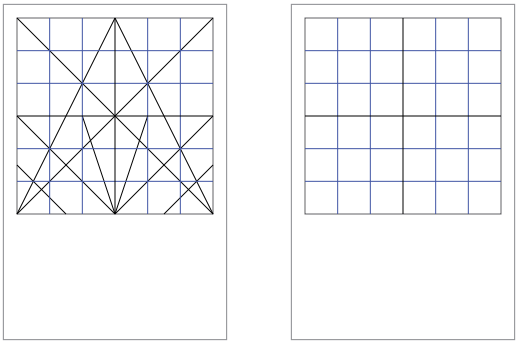


Diagram 6 a–d: Drawing the grid, construction of thirds & sixths – *above & below*.



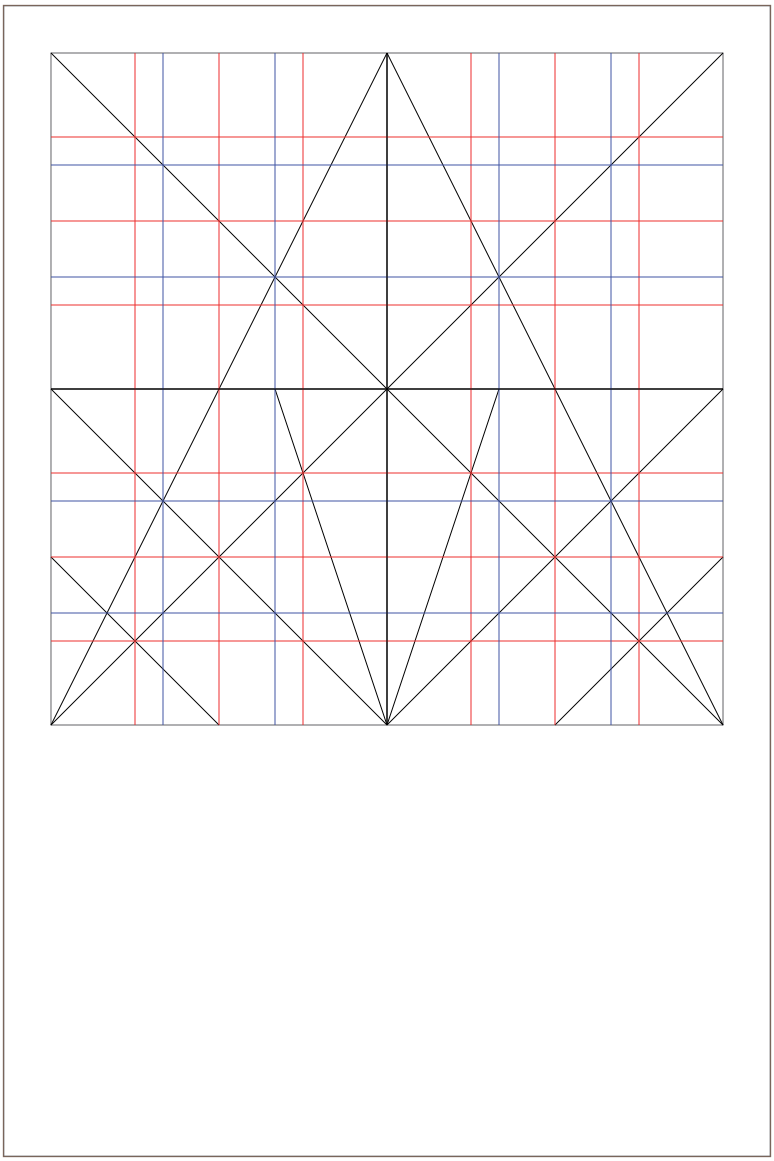
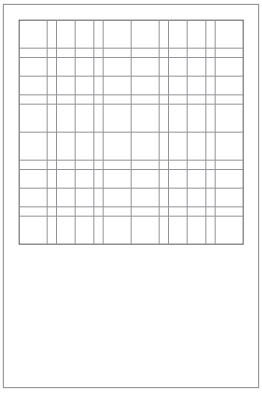


Figure 6: Image showing both grids and all construction lines at full size – *above*.

Figure 7: Image showing both grids without construction lines – *below.*



Appendix

Part three: Studio assignment A5

Images from handout

Overview:

Right: Four variations of four field and figure compositions.

Each grouping demonstrates a distinct set of choices in sequence.

Study these examples closely. Can you identify the tactics and strategies in play? What is the relationship between figure and field for each composition?

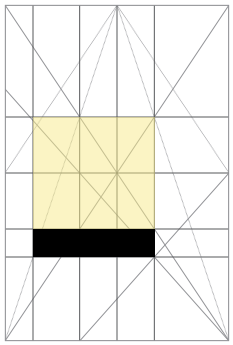


Figure 1a.

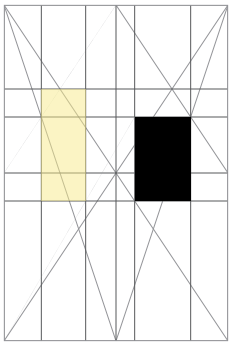


Figure 2a.

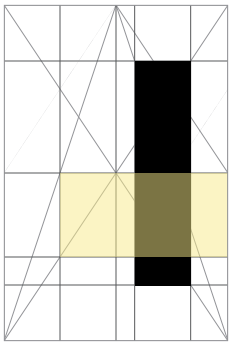


Figure 3a.

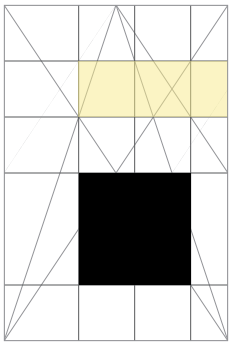


Figure 4a.

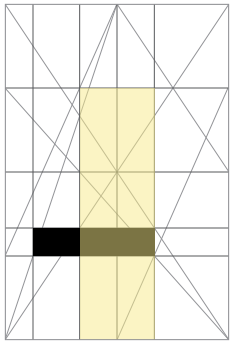


Figure 1b.

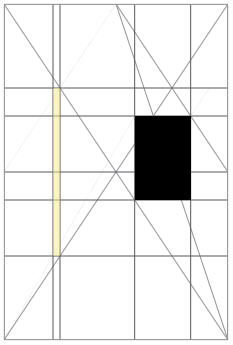


Figure 2b.

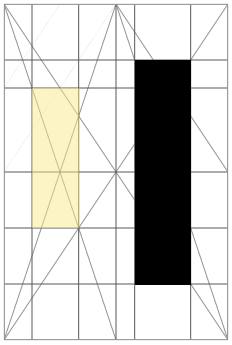


Figure 3b.

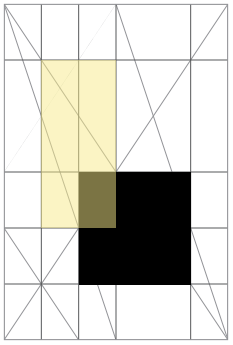


Figure 4b.

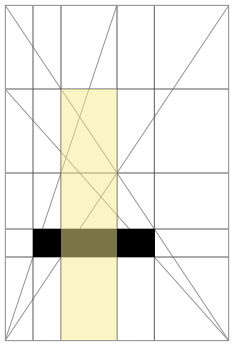


Figure 1c.

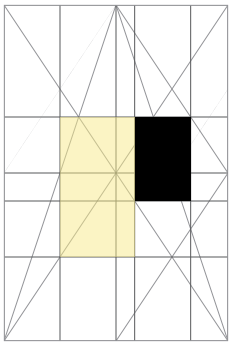


Figure 2c.

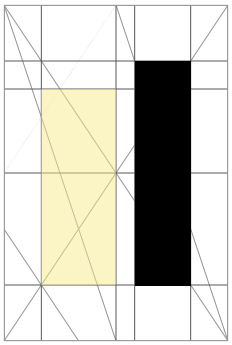


Figure 3c.

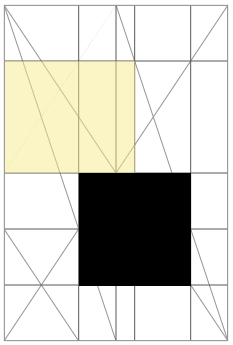


Figure 4c.

Figure 1d (below).

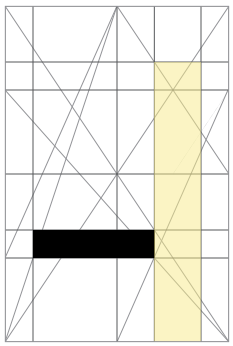


Figure 2d (below).

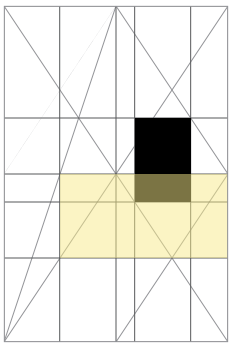


Figure 3d (below).

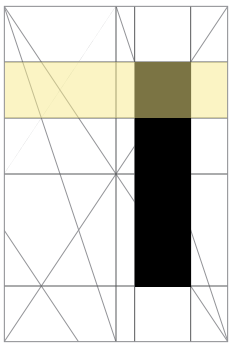
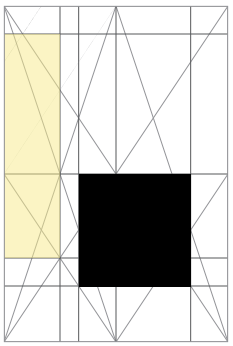


Figure 4d (below).



H5: Field to figure relationships

Field examples:

Fields in figure-ground compositions can sponsor multiple formal events. In the case of today's assignment, the second visual field represent a discreet horizontal plane in relationship to the existing figure-ground composition. In that role, it interacts with the existing figure in a compositional strategy that by convention represents vertical elements.

Furthermore, these second fields have several limits placed on them. They can touch only one boundary edge of the ground and their general scale should be similar to the original figures. Given those restrictions, several formal relationships help describe the clearer possible relationships between field and figure. The examples to the right demonstrate three simple groups of interactions that you should consider in working through this assignment. Those interaction groupings are.

- **Extend and reflect:** these conditions assume a symbiotic relationship to the figure generally along a single axis and edge.
- **Envelop, surround & overlap:** these conditions imply volumetric relationships about more than one edge and generally involve more than one axis.
- **Balance & define:** these conditions imply compound interdependence and often result in a strongly implied gestalt reading of negative space.

These groupings are neither hard and fast rules nor exclusive. Instead, they are ways of describing the formal relationship that a limited field may have to a figure. Consider these terms as useful for discussion and as topics for your Journal.

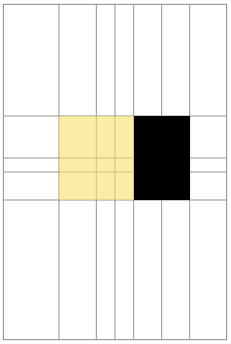


Figure 1a: Fields can extend.

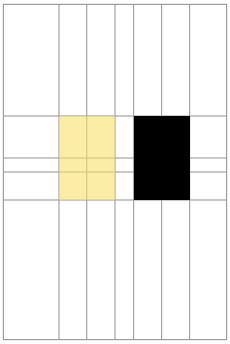
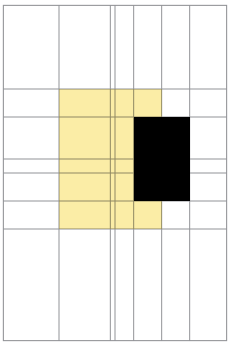


Figure 1b: Fields can reflect.



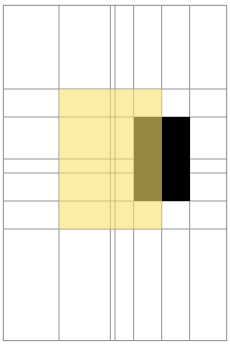
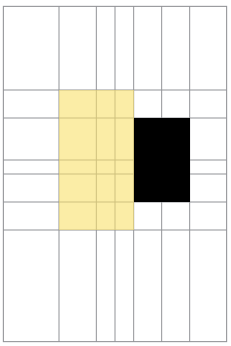


Figure 2a&b: Fields can envelop, surround & overlap.



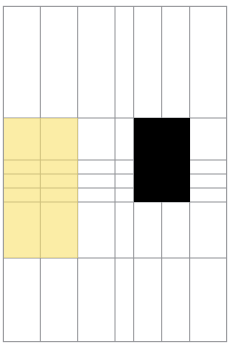


Figure 3a&b: Fields can balance & define.

Appendix

Part four: Studio assignment A27

Images from handout & lecture

Figure 8: Card example, *datum diagram.*

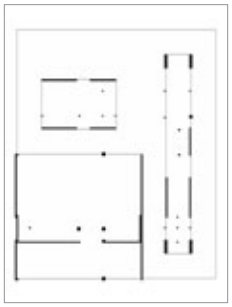


Figure 8: Original plan, separate forms.

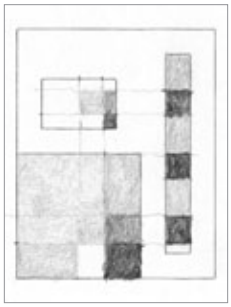


Figure 9: Diagram showing datum.

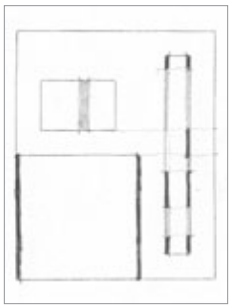


Figure 10: Diagram of grain.

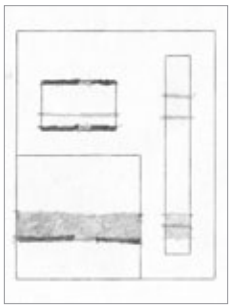


Figure 11: Diagram of cross-grain.

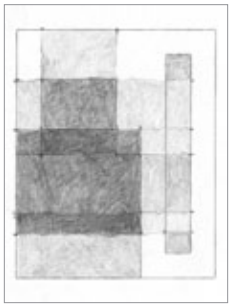


Figure 12: Diagram of spatial order.

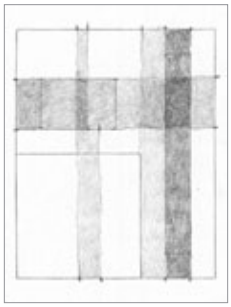
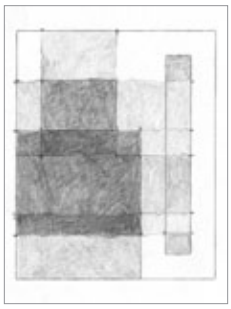
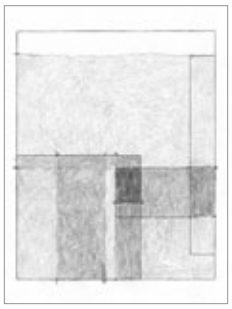
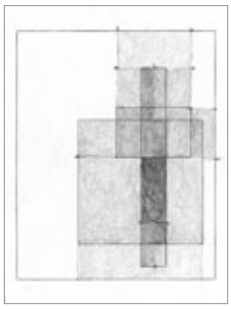


Figure 13: Diagram of principal path.

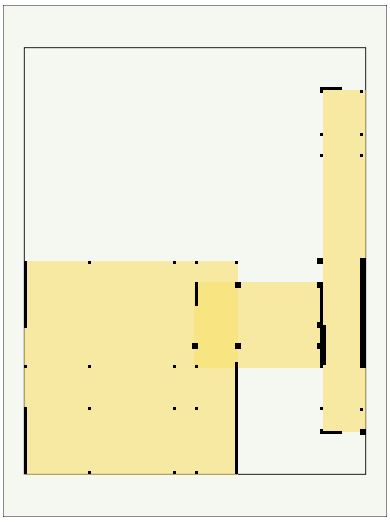




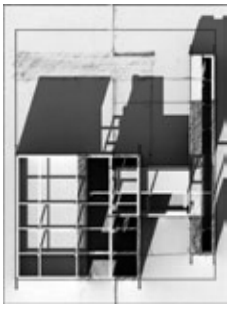


Figures 7a, b & c: Comparison of spatial hierarchy order of all three compositions.

Bridged elements:
plan, models & diagrams



Above:
Bridged scheme plan.
Left:
Top view.
Below:
Corresponding superimposed diagrams of datum, grain, cross-grain, path and spatial order.



Appendix

Part five: Principal investigators

Biographies

Jeff Balmer is an Assistant Professor at the School of Architecture. He completed his Bachelor of Environmental Studies (1989) and Bachelor of Architecture (1992) from the University of Waterloo, and a Master of Architecture from Iowa State University in 1998. His scholarship engages Beginning Design education, and includes a focus on the history and practice of the architectural diagram. He recently received an ACSA Creative Achievement Honorable Mention for the pedagogy of ARCH 2601, the undergraduate writing seminar, and co-chaired MADE, the 2010 National Conference on the Beginning Design Student (NCBDS). As coordinator for the First Year program, he teaches the first-year undergraduate studio sequence, as well as the second-year writing seminar, and an advanced seminar in Postwar cultural history. He has just published *Diagramming the Big Idea: Methods for Architectural Composition* (Routledge 2012) with colleague and co-author Michael Swisher.

Nicholas Senske is an Assistant Professor of Architecture, specializing in digital design integration. His current research draws from the fields of education and computer science and seeks to improve how architecture students learn computer software and computational thinking. In collaboration with other faculty, he is developing this research into a new curriculum for digital design within the School of Architecture. He teaches second-year undergraduate studio and the digital methods seminar. Recent papers include \Reconsidering the Ethics of Transparency\" (ACSA with Kristina Luce) and \"Sketching with Code: Developing Procedural Literacy in Early Architectural Education\" (Beginning Design Conference). Prof. Senske holds a Bachelor of Architecture from Iowa State University and a Master of Science in Architectural Studies (SMARCHS) in Design Computation from MIT. He is currently a Ph.D. Candidate in Architecture at the University of Michigan, Ann Arbor.

Michael Swisher is an Associate Professor at the School of Architecture at UNC Charlotte. His involvement with foundation studies extends across a 30-year teaching career. His primary teaching responsibilities include first year studio and skills, as well as visual studies electives. A graduate of Washington University in St. Louis, and the Massachusetts College of Art, he has exhibited his paintings commercially for over three decades. He has co-authored or authored papers in philosophy of mind and foundation pedagogy. He has just published *Diagramming the Big Idea: Methods for Architectural Composition* (Routledge 2012) with colleague and co-author Jeff Balmer