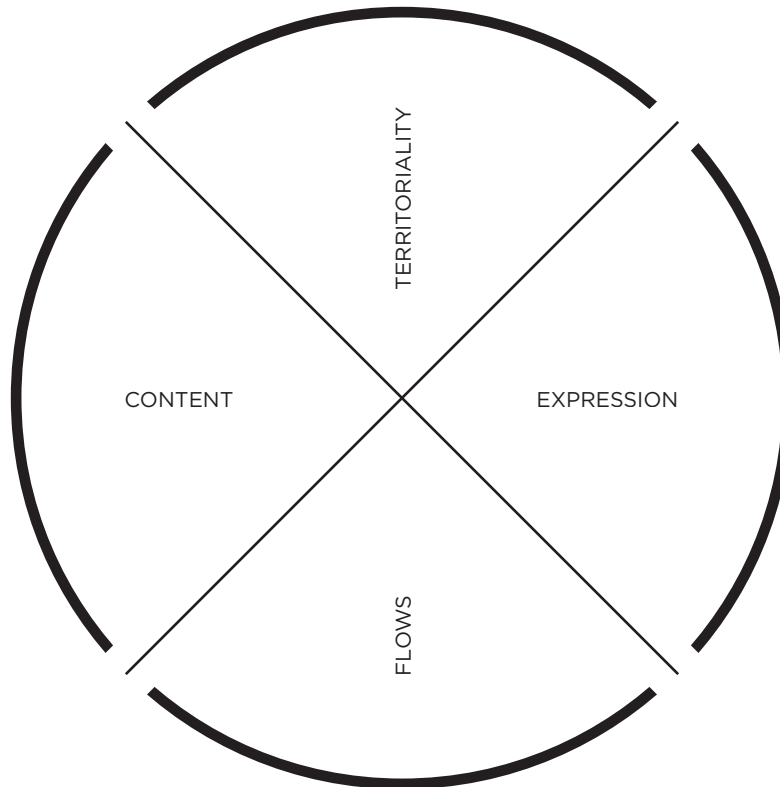


DESIGN STUDIO MATRIX:

SUPPORTING THE DECISION-MAKING PROCESS AS PART OF A REFLECTIVE PRACTICE



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UNIVERSITY OF CALGARY
SCHOOL OF ARCHITECTURE,
PLANNING AND LANDSCAPE

Design Studio Matrix: Supporting the decision-making process as part of a reflective practice

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DESIGN STUDIO MATRIX:

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AS PART OF A REFLECTIVE PRACTICE**

EXECUTIVE SUMMARY

Design is described as a process of making decisions based on reflection in and on action (Schön, 1983).

This report outlines the findings of the Design Studio Matrix: Supporting the Decision-Making Process as Part of a Reflective Practice research project, and provides recommendations for both future research and teaching.

The Design Studio Matrix was funded by the grants program of the Taylor Institute for Teaching and Learning at the University of Calgary. The principal grant holder was Dr. Fabian Neuhaus, Associate Professor at the School of Architecture, Planning and Landscape, University of Calgary.

The project was carried out at the School of Architecture, Planning and Landscape, University of Calgary, with a focus on three Masters design studio courses: the EVDS 620 Urban Design Studio/EVDA 782.01 Senior Architecture Design Studio course in fall 2019, the EVDP 644 B02 Advanced Professional Planning Studio course in winter 2020 and the EVDP 616 Planning course in fall 2020.

The project ran for two years, from spring 2019 to Spring 2021. Its aim was to analyze design studio pedagogy and to further develop the Design Studio Matrix (DSM), a teaching and learning tool that was developed by Dr. Graham Livesey, Dr. Enrica Dall'Ara and Dr. Fabian Neuhaus. The hypothesis was that the DSM would help shift the focus of design education away from the product towards the process and the reflection thereof.

The research was led by Sandra Abegglen and adopted a mixed or multi method approach consisting of focus group discussions, semi-structured interviews, in-class observations and questionnaires. In addition, material created by the students such as diagrams and survey data were analyzed. Ethical approval for the research was sought and granted by the University of Calgary Conjoint Faculties Ethics Board in August 2019.

A total of 100 students have worked with the DSM to date. Of those, 53 students were registered for one of the courses included in this study, with 38 students fully participating in the research and 3 students partially participating. Participation in the research project was voluntary, with students being able to opt in or out of all, or particular research elements.

The findings show that:

- Students had no issues understanding the DSM as a framework;
- Students found the DSM useful to 'track' the progress and development of their projects;
- Particular usefulness of the DSM was indicated for the initial stage of design projects, chiefly the site analysis;
- Students most favored the DSM in the course that facilitated utilization of the tool but did not ask for explicit application in projects or use it as an assignment;
- Students struggled with some of the DSM terminology as it was difficult for them to grasp the theoretical framing and conceptual meaning;
- Students were undecided about the idea of applying the DSM elsewhere, although some students used it in other projects/classes. Some students found the tool restrictive;
- Specifically the application of the DSM in practice seemed difficult for students to imagine, maybe due to a distinction between study and professional practice.

The fieldwork indicates that tools like the DSM can help shift instructors' and students' focus away from the final studio product towards the process. However, to fully initiate a paradigm shift, the development of design process skills needs to take center stage in design education. Thus, further research into design studio pedagogy and the usefulness of design process management tools like the DSM is recommended, for example, through a comparative analysis of different design studio courses and/or approaches.

To successfully prepare students for today's complex and fast-changing world (Bashier, 2014; Crowther, 2014; Findeli, 2001; Mewburn, 2012; Pasin 2017; Salama, 1995; Soliman, 2017; Wang, 2010), students need to be more than good designers, and do more than produce good designs. They need to be able to critically reflect on their design and their design process so that their designs, as suggested in Universal Design, are accessible and usable for everybody.

ENDORSEMENTS

Dean School of Architecture, Planning and Landscape

Dr. John Brown

Dean, School of Architecture, Planning and Landscape, University of Calgary

This report is being released at an interesting time. Over the past year, as the world has been in the grip of a public health crisis, we have seen first-hand how poorly organized our built environment is to effectively manage an infectious disease pandemic. Simultaneously, the rise of the Black Lives Matter movement finally started to raise our collective consciousness about structural racism and how the built form of our cities and communities reflects and reinforces inequality. And in the background, of course, lurks the pending crisis of climate change, with the majority of green house gas emissions coming from buildings and the cars we must drive almost everywhere because of the layout of our cities and transportation systems.

All of these problems with the built environment of cities are rooted in design decisions, made consciously or unconsciously by generations of trained professionals. Architects, planners, and landscape architects share a proportionate responsibility for the legacy of these bad decisions. Looking forward, our professions also have a responsibility to help reverse the impact of these poor choices and to start building future versions of our cities that are more healthy, equitable, and sustainable.

Design is the signature process of our disciplines. Poor design decisions got us into these challenging situations and good design decisions can help make the situation better. The critical reflection on design as a decision-making process undertaken in this study begins to illuminate the complex ways in which the design process works and provides a framework for designers to reflect on the nature of the decisions they make through that process. The need for this critical examination of the design process has never been greater. The work contained in this Report reflects our School's commitment to researching strategies for impactful innovation and our belief in the important role that design pedagogy plays in shaping our world.

Project Advisory Committee

Dr. Anne-Marie Dorland

Assistant Professor, Bissett School of Business, Mount Royal University

The findings presented in this report may, at first, appear to focus on new approaches to teaching and learning within the design studio. However, what Dr. Neuhaus and his colleagues have developed and shared here is in fact a response to a critical question faced by all educators interested in developing creative capacity within a student community: how can we help students shift their attention from product to process in their learning work? The Design Studio Matrix provides a unique response to that question, presenting a creative pedagogical approach that aligns the vital elements of personal reflection embodied within experiential and inquiry-based learning with the praxis of creative and innovative problem solving. The primary contribution of this fascinating tool is the work it does to help students connect the ambiguous, personal and creative process-oriented learning outcomes of their design studio classes with the highly impactful design products that form the majority of their assessment structure. With the DSM in hand, instructors can confidently begin the work of dissecting the design process in order to support the development of innovative and human-centred design solutions within the design studio classroom. I look forward to integrating the findings of this project within my own pedagogy inside and outside of the studio space, and to engaging with new ways to support reflective practice development informed by this work in the future.

Dr. Patti Dyjur

Academic Lead Learning Technology and Design, Taylor Institute for Teaching and Learning, University of Calgary

As an Educational Development Consultant at the Taylor Institute for Teaching and Learning, part of my role is to support a culture of teaching and learning excellence on campus and collaborate with others to strengthen evidence-based teaching and learning approaches. As part of the advisory committee for the Design Studio Matrix (DSM) study, led by Dr. Fabian Neuhaus, I have provided feedback to the research team at a couple of strategic points in the study.

Research studies that examine a signature pedagogy within a discipline offer benefits such as better understanding its strengths, identifying good practices, and result in enhanced student learning opportunities. Dr. Neuhaus and colleagues created the DMS to be used in conjunction with a signature pedagogy in the School of Architecture, Planning and Landscape. The focus of the study was to investigate whether the Design Studio Matrix was effective in refocusing student attention from the end product to the design process when working on projects. Throughout the project, the research team sought feedback from multiple sources, including students, colleagues who used the Matrix in their courses, and the advisory committee, revising the Matrix as needed to make it easier to use and more helpful during the design process.

Results of the study have important implications for the faculty. It was interesting to me that students found more value in using the Matrix in early stages of a product, perhaps to guide their work, than as a reflective tool once a project was completed. The researchers also uncovered other potential uses of the DSM, as well as identifying possible limitations to its use.

Overall, I found that the research team took a thoughtful and thorough approach to the study. In particular I applaud them for continuing on with the work amidst a global pandemic - no small task! The findings will be valuable not only within the School of Architecture, Planning and Landscape, but also to other institutions with similar programs. I wish them every success in disseminating their findings broadly!

Dr. Marjan Eggermont

Teaching Professor, Schulich School of Engineering, University of Calgary

A great summary of a 'design as research' project. As with all design methods and processes there is a level of 'after the fact' application based on the student comments. This is the case in all design courses, and I have experienced this myself extensively: the Matrix and any other design process diagram for that matter is an underlying support to enrich and guide student projects but often is seen as busy work. I have taught in the area of engineering design since 2002 both in first year cornerstone courses and in bio-inspired design courses. Both used a different design process and students tend to fit work to purpose when they first start out. There is a great deal of design fixation in novice designers – the first idea is what students tend to stick to – so any process steps beyond this is seen as somewhat annoying and as something we as professors make them do. Designers operate at various levels of expertise and students, at the novice level, need these kinds of interventions to hone their skills (if we think of the work of Kees Dorst* they still have 6 levels to go). This is a great study and I hope the researchers continue with this work and create an open-source platform for others to participate and co-design what I think is an interesting and well-rounded decision-making tool.

* International Engineering and Product Design Education Conference 2-3 September 2004 Delft, The Netherlands: Levels of Expertise in Design Education, Kees Dorst and Isabelle Reymen.

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The Design Studio Matrix: Supporting the Decision-Making Process as Part of a Reflective Practice research project was funded by the grants program of the Taylor Institute for Teaching and Learning at the University of Calgary, the University of Calgary Teaching and Learning Grant. The principal grant holder was Dr. Fabian Neuhaus, Associate Professor at the School of Architecture, Planning and Landscape, University of Calgary.

The project collaborators were in (alphabetical order): Sandra Abegglen, Researcher, School of Architecture, Planning and Landscape, University of Calgary; Dr. Enrica Dall'Ara, Assistant Professor, Landscape Architecture, School of Architecture, Planning and Landscape, University of Calgary; Dr. Graham Livesey, Professor Architecture, School of Architecture, Planning and Landscape, University of Calgary; and Dr. Mary-Ellen Taylor, Associate Dean, Planning and Landscape Architecture, School of Architecture, Planning and Landscape, University of Calgary.

The project advisory committee consisted of (in alphabetical order): Dr. Anne-Marie Dorland, Assistant Professor, Bissett School of Business, Mount Royal University; Dr. Patti Dyjur, Academic Lead Learning Technology and Design, Taylor Institute for Teaching and Learning, University of Calgary; and Dr. Marjan Eggermont, Teaching Professor, Schulich School of Engineering, University of Calgary.

Special thanks goes to all those design studio course students at the School of Architecture, Planning and Landscape, University of Calgary, who participated in this study. Without their willingness to discuss and share their experiences this project would not have been possible.

Many thanks also go to Hal Eagletail, Tsuut'ina Knowledge Keeper and Master of Ceremonies, who was an instructor for two of the design studio courses included in this research and who provided valuable, additional feedback on the Design Studio Matrix.

Thanks also go to those instructors and professionals who have joined the studios as guest critics and who have engaged with the Design Studio Matrix through student projects and presentations. Their inputs have helped link the project and tool to a broader context.

1. INTRODUCTION TO THE PROJECT

Whilst the design studio format has a very long tradition and is widely practiced at design schools around the world there is little research into its practice. The aim of the Design Studio Matrix: Supporting the Decision-Making Process as Part of a Reflective Practice research project was to analyze design studio pedagogy and to further develop the Design Studio Matrix (DSM) as a learning tool in the design studio setting. The DSM was developed by Dr. Graham Livesey, Dr. Enrica Dall'Ara and Dr. Fabian Neuhaus, all of whom are based at the School of Architecture, Planning and Landscape (SAPL), University of Calgary (UofC), in summer 2018 to help their students manage the design process. The DSM was 'tested' in the EVDS 620 Urban Design Studio/EVDA 782.01 Senior Architecture Design Studio course in fall 2018 and, based on the instructors' experience and the students' feedback, further developed in summer 2019. The usefulness of this new, updated DSM was formally investigated in the EVDS 620 Urban Design Studio/EVDA 782.01 Senior Architecture Design Studio course in fall 2019, the EVDP 644 B02 Advanced Professional Planning Studio course in winter 2020 and the EVDP 616 Planning course in fall 2020.

SAPL Design Studio Courses

=

EVDS 620/EVDA 782.01 + EVDP 644 B02 + EVDP 616

There are few pedagogical tools available that help students plan, structure, record and evaluate the design process (Bashier, 2014; Mewburn, 2012; Salama, 1995; Soliman, 2017). The DSM is quite unique in this regard as it provides guidance for students in the decision-making process while also helping them to reflect on their decisions. The hypothesis was that the DSM would help shift the focus of design learning away from the product towards the process and the reflection thereof. It was hoped that this would allow students to lead on the design process and thus strengthen students' ownership not only of their designs but also of their learning, a constructive alignment of teaching and learning (Biggs, 1996).

Design Studio Matrix

=

plan + structure + record + evaluate

The aim of the research project was to investigate whether the DSM:

- Leads to more successful student learning and ultimately greater student satisfaction;
- Supports the shift from product to process, putting design studio learning center stage; and
- Allows students and faculty to discuss their experience based on a shared method.

To explore these questions, the research project adopted a mixed (or multi) method(s) approach (Cresswell, 2014; Hesse-Biber & Johnson, 2015; Plano Clark & Ivanova, 2016; Watkins & Gioia, 2015), gathering data through questionnaires, focus group discussions, semi-structured interviews and in-class observations. The data collection also included the responses provided by students in the University course evaluation

survey, the Universal Student Ratings of Instruction.¹ Furthermore, in the professional planning studio course EVDP 644 B02 and the planning studio course EVDP 616, the diagrams completed by students for their desk/studio crits, project critiques in which student and instructor(s) discuss an interim state of a proposal/solution to a design task/problem, were included in the data analysis.

Research Design
=
mixed (or multi) method(s) approach

A total of 41 (38f/3p²) students participated in the research project: 24f/2p students from EVDS 620/ EVDA 782.01 2019, 9 students from EVDP 644 B02 2020 and 5f/1p students from EVDP 616 2020.

Participation in the research project was completely voluntary, with students being able to opt in or out of all or particular research elements (the questionnaires, the discussions/interviews and the observations). Participants could decline to answer questions asked as part of the research process without any consequences. They could also withdraw from the project without giving any reason for doing so up until the end of the data collection process. The data collection was kept confidential, and completely separate from the course instruction and performance evaluation. Ethical approval for the study was sought and granted by the University of Calgary Conjoint Faculties Ethics Board in August 2019.

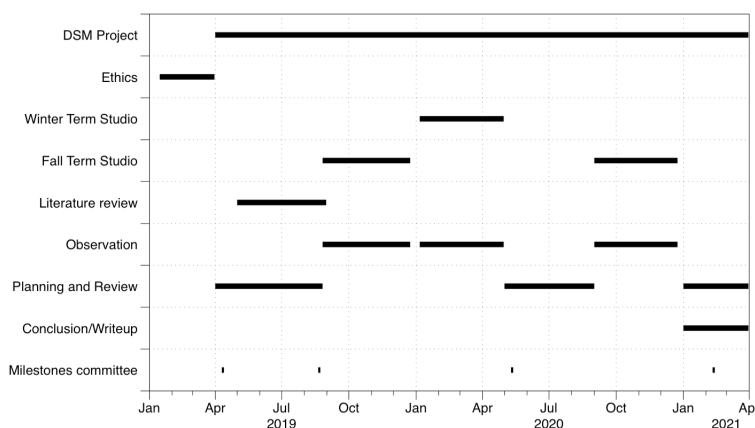


Fig. 01: Proposed Design Studio Matrix project schedule for 2019-2021

The project ran for two years, from spring 2019 to spring 2021. The initial time plan was as follows, with small adaptations made later to accommodate changes in staffing and delays due to the Covid-19 pandemic: The next chapter, 2. Context of Project, provides further information to enhance the understanding of the research project and its aims. The school where the project was carried out is introduced as well as the idea of design studio learning. The section also outlines the learning tool in question, the Design Studio Matrix.

¹ See: <https://www.ucalgary.ca/provost/teaching-learning/quality-teaching-and-learning/universal-student-ratings-instruction>

² f = full participation: participation in all research elements; p = partial participation: non-participation in one or more research elements.

2. CONTEXT OF THE PROJECT

The Design Studio Matrix research project was carried out at the School of Architecture, Planning and Landscape (SAPL)³ at the University of Calgary (UofC)⁴, a public research university in Calgary, Alberta, Canada. The school was established in 1971 as the Faculty of Environmental Design modeled on the College of Environmental Design (also known as Berkeley CED or simply CED), which was established in the late 1950s at the University of California, Berkeley (Peters, 1979). SAPL offers a variety of degree programs, both course-based (Master of Architecture, Master of Landscape, Master of Planning) and thesis-based (Master of Environmental Design, Doctor of Philosophy), as well as an embedded certificate (Sustainability Studies) and a minor field specialization (Architectural Studies). The programs prepare students for professional careers in the design of buildings, cities and landscapes. They are all framed and taught interdisciplinarily with a trans-scalar approach to built and natural environments. In their studies, students explore theories and approaches that foster both their design thinking and their design practice. This involves problem-based learning in the design studio as well as 'hands-on' projects in the field.

The focus of the Design Studio Matrix research project was on three SAPL Masters design studio courses that have all embedded and used the DSM to various degrees: EVDS 620 Urban Design Studio/EVDA 782.01 Senior Architecture Design Studio 2019; EVDP 644 B02 Advanced Professional Planning Studio 2020; and EVDP 616 Planning 2020 - with three other SAPL Masters design studio courses (EVDS 620 Urban Design Studio/EVDA 782.01 Senior Architecture Design Studio 2018; EVDP 644 B02 2020; and ARST 444 Studio II in Architecture 2020) that have utilized the DSM without formal evaluation.

2.1 The Design Studios

The interdisciplinary design studio course EVDS 620/EVDA 782.01 2019 was open to Masters students from all three disciplines offered at SAPL - architecture, landscape architecture and planning - while the other two courses EVDP 644 B02 2020 and EVDP 616 2020 were directed at planning students. Hence, the three studio courses differed in so far as one had an interdisciplinary cohort and instructor team while the other two were made up of students of a single discipline and an instructor from that same discipline. EVDS 620/EVDA 782.01 2019 had a total of 32 students registered, EVDP 644 B02 2020 had a total of 11 students subscribed and EVDP 616 2020 had a total of 10 students attending.

EVDS 620/EVDA 782.01 2019 + EVDP 644 B02 2020 + EVDP 616 2020
=
53 students

Of those 53 students, 41 students participated in the research - 38 students took part in all of the research elements, while 3 students took part in only some of the research elements.

All three studio courses, EVDS 620/EVDA 782.01 2019, EVDP 644 B02 2020 and EVDP 616 2020, provided students with a design brief asking them to develop a vision or solution within a particular framework. Students were expected to draw on their knowledge and experience, and advance their ideas through

³ See: <https://sapl.ucalgary.ca>

⁴ See: <https://www.ucalgary.ca>

gradual input and personal reflection. This means that the courses were modeled on ‘traditional’ design studio practice as developed by the Ecole des Beaux Arts (Drexler, 1984; Van Zanten, 1975) and the Ecole Polytechnique (Madrado, 1994) in 19th Century France, and later adapted by Bauhaus (Wingler, 1975) in Germany in the early 20th Century, and then practiced by the University of California, Berkeley (Peters, 1979) in the 50s. The aim was for students to learn about design and also to become designers themselves, learning about and learning to be (Dutton, 1987).

The outputs produced by students consisted of drawings, visualizations, (3D) models, and text, and in the professional planning studio, the creation of an online engagement platform. These outputs were assessed and graded. They were also presented to experts, practitioners and the wider public. In EVDS 620/EVDA 782.01 the final ‘showcase’ included an exhibition at the CBDLab, in EVDP 644 B02 the final critic session was live streamed online and in EVDP 616 project proposals were presented to an Indigenous panel consisting of Elders, community leaders and professionals.

The content of each course is described in more detail in the following sections.

2.1.1 EVDS 620/EVDA 782.01 2019

The 2019 interdisciplinary design studio course EVDS 620/EVDA 782.01 focused on cross-culture (Interchange: Cross Culture Approaches to Design). The design studio program had been developed in collaboration with the Tsuut’ina Nation, a First Nation Band whose reserve is adjacent to the southwest city limits of Calgary. It explored Indigenous approaches to and interpretations of design alongside Western understandings. Students were asked to work in interdisciplinary teams (architecture, landscape architecture and planning) and individually on a pre-selected location, the TAZA development⁵, a joint venture between the Tsuut’ina Nation and Canderel, to develop a proposal that acknowledged the land and its people in an innovative and sustainable (economically, environmentally and socially) manner.

EVDS 620/EVDA 782.01 2019
=
cross-culture + interdisciplinarity

Students were introduced to the Tsuut’ina culture by Hal Eagletail, a traditional Knowledge Keeper and instructor on the course. They were further guided by Tsuut’ina Elders Harley and Gilbert Crowchild as well as design professionals and experts, many of whom have an Indigenous background. The aim of the design studio program was to develop students’ cross-cultural understanding and to foster their interdisciplinary design skills. The specific learning outcomes for students (as formulated in the course handbook) were:

⁵ See: <https://canderel.com/project/taza/> and <https://togetherattaza.com>

- To understand urban design processes and principles, and to formulate and design the process (both individually and collaboratively);
- To understand how critical observation, analysis, and experimentation apply to design processes;
- To understand the perspectives of various stakeholders;
- To engage with and respond to a range of perspectives and integrate them into the respective project process;
- To work effectively in interdisciplinary teams;
- To learn about Indigenous ways of knowing and to integrate that into a proposal; and
- To refine their abilities to use a range of media to communicate effectively.

The studio was organized in a sequence of phases (four in total) each of which had its own assignment (1 Water and the Land; 2 Matrix and Diagram; 3a Circular Process; 3b Knowing the Land; 4 Design Charrette). Together, these assignments, plus a final portfolio (5 Portfolio) that showcased the work undertaken, made up the final grade. Several assignments asked students to directly work with the DSM. For example, Assignment 2, Matrix and Diagram, required students to familiarize themselves with the four DSM families (Territoriality; Expression; Flows; Content) and 'map' their project ideas accordingly, and Assignment 3b asked them to write about two of the 12 DSM categories (Mosaic; Lines; Patches; Cultural; Social; Practice; Ecology; Bodies; Exchange; Material; Technology; Agency). Most of the assignments were undertaken in interdisciplinary teams of three, with the exception of Assignment 3b, which was an individual writing task and Assignment 4, which was undertaken in teams of ten to twelve.

2.1.2 EVDP 644 B02 2020

The 2020 professional planning design studio course EVDP 644 B02 focused on the Crossroads community in northeast Calgary (Crossroads). The community has a lot of amenities and excellent proximity to major urban facilities and infrastructures including the Bow River, the Downtown core, the Calgary Zoo, the Telus Spark science centre, and the LRT. However, it also faces several challenges, mainly in connection with large-scale transport infrastructure and industrial land use, through which the community is relatively isolated. This unique setting allowed students to explore contemporary themes and issues in planning and professional planning practice while working with the community in direct partnership to develop visions and solutions.

EVDP 644 B02 2020

=

Crossroads

Initially, the students were able to facilitate in-person workshops with and for the community. However, because of the Covid-19 pandemic, the initial program had to be adapted. Instead of holding further events in the community, an online platform was established that allowed students to engage with community members in a physically distanced manner. This also required the adaptation of some of the assignment briefs. For example, Assignment 5, Play, asked students to develop a gaming strategy that could be used to engage with the community online rather than in a workshop format. However, the number of assignments, seven in total (1 Situation; 2 Input; 3 Actor Network; 4 Workshop; 5 Transform; 6 Play; 7 Report) stayed the same. Together, these assignments made up the final grade, with an online 'showcase' at the end where

students presented their proposals and visions to invited guests, the community and the wider public.

Contrary to EVDS 620/EVDA 782.01 2019, students attending the professional planning studio were not asked to utilize the DSM in their assignments but had to complete weekly diagrams outlining how they 'rated' their projects against the twelve DSM categories. They had to 'map' these ratings with the resulting visualizations to form part of their weekly, reflective desk critics.

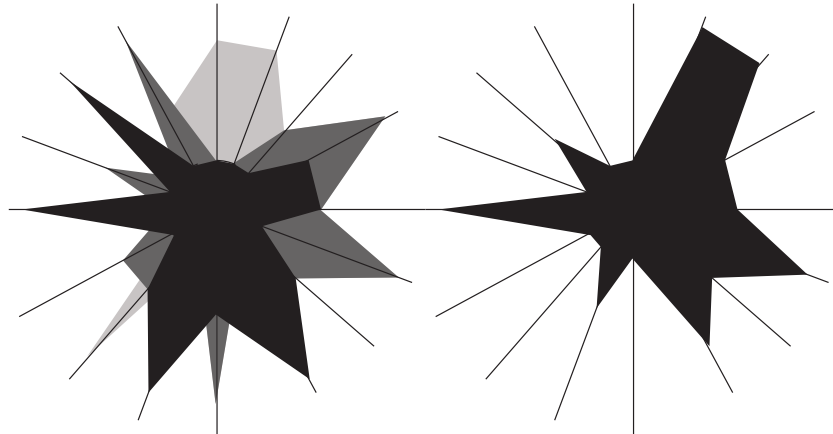


Fig. 02: Design Studio Matrix sample diagrams (as shown in the course handbook)

2.1.3 EVDP 616 2020

The 2020 professional planning studio EVDP 616 entitled Kuniya was held entirely online due to Covid-19 restrictions. All interaction was on screen and virtual. The studio used Zoom for communication and a shared Miro board for collaborative working. Everybody's work was shared with the group on that board so that students were able to see what others were working on.

The studio explored urban design in a cross-cultural context. Similar to the EVDS 620/EVDA 782.01 2019 design studio program, the content of this course had been developed in collaboration with the Tsuut'ina Nation. Hal Eagletail, who was an instructor for the interdisciplinary design studio, part of the teaching team for this course, as an instructor, and a cultural advisor.

EVDP 616 2020

=

Kuniya

The studio focused on the northwest corner of the Tsuut'ina Reserve, Redwood Meadows, the first non-native development on reserve land in Canada that made history as the first development under the 3P Partnership between the Nation, the province and private residents. This was complemented by an exploration of the TAZA project along the eastern side of the Tsuut'ina Reserve, TAZA, the largest development project currently underway on reserve land in collaboration with a private developer.

Students were asked to work with the notion of “ethical space” as outlined by Ermine (2007) to develop a design proposal that acknowledges the roads that cut through the reserve, Highway 22x in the northwest leading from Bragg Creek to Cochrane and the Calgary Ring Road in the east. The question posed to students was how those travel corridors may be sustainably utilized/activated, while acknowledging the broader cross-cultural context and current urban developments.

The assessment consisted of six components: 1 Me, Myself and I or how can we Start a Conversation, 2 Analysis, 3 Reference, 4 Proposal, 5 Reflection and 6 Portfolio. Students were asked to develop their work in teams of two and, in parallel, develop their own personal position based on an emerging understanding of Indigenous planning.

The DSM diagrams were used in weekly iterations to reflect on progress and help decide on the next steps. These diagrams formed the basis of the desk review discussions. They were based on the same category ‘ratings’ as those utilized in EVDP 644 B02 and, as in EVDP 644 B02, did not form part of the assessment. However, rather than being submitted to their instructors, these diagrams were uploaded to a shared whiteboard for everybody to see and comment on.

2.2 Design Studio Practice

The design studio is the signature pedagogy for the design disciplines (Crowther, 2013; Motley, 2017; Peel, 2011; Schrand & Ellason, 2012; Shulman, 2005). It focuses on problem- or inquiry-based learning (Schön, 1985), although, over time, design studio practice has turned into a more formalized and more academic form of apprenticeship. Design studio practice is now part of university teaching and learning. Its pedagogy is student-focused, meaning that students direct the process, although the learning is closely guided by instructors. There is usually a great emphasis on creativity and interaction (Ashraf & Salama, 2007) with the outcomes focused on visualizations (both print, 3D and virtual). It is a socially active environment of experimentation (Ioannou, 2018) where students learn by doing (Gibbs, 1988) and experiencing (Kolb & Fry, 1975).

While the design studio is the dominant mode of delivery within design education, it is also the dominant learning environment for design students (Corazzo, 2019; Schön, 1987). It is the ‘place’ where design education happens, the physical learning environment - the “pivot and gathering point of all knowledge” (Mostafa & Mostafa, 2010, p. 310). In the case of this project, the design studio also refers to the description of particular courses offered to students at SAPL, the design studio courses. This can be confusing for ‘outsiders’ as the three are often conflated. Hence, in this report, particular care has been taken to clearly distinguish between: the design studio courses offered at SAPL and used as a sample for this research; the design studio practice, the “designerly doing” (and learning) in the design studio (Vyas, Veer & Nijholt, 2013); and the design studio as the physical teaching and learning place.

$$\begin{array}{c} \text{Design Studio} \\ = \\ \text{place + pedagogy + course} \end{array}$$

While a lot has been written about the design studio as a place for learning, there has been less talk about its pedagogy, and even less about approaches and tools that could support educators with their teaching and students with their learning. Hence, this study investigated a tool, the Design Studio Matrix, that has been developed to support both instructors and students in the management of the design process. As Findeli (2001) argues, we need to rethink design education - theoretically, methodologically and ethically - for it to be 'fit' for the 21st Century. Design students need to learn more than how to produce 'good' designs and be 'good' designers. They need to be able to adapt their designs and their 'working' to an increasingly complex and uncertain world. This requires "a new paradigm for design studio education" (Wang, 2010), one that actively combines objective rationality and subjective creativity (Schön, 1988).

2.3 The Design Studio Matrix

The Design Studio Matrix (DSM) was developed by Dr. Graham Livesey, Dr. Enrica Dall'Ara and Dr. Fabian Neuhaus in summer 2018 to help students structure the design process and decision-making within that process. The aim was to enhance student learning and to move away from the focus on the final product towards the process of its creation. It was hoped that this would allow students to take responsibility not only for their designs but also for their learning, and help them apply their knowledge to different projects and situations. Hence, they designed the DSM to be specific, and of use to their own students and courses, yet universal, so that it could be utilized outside the classroom, in the professional world.

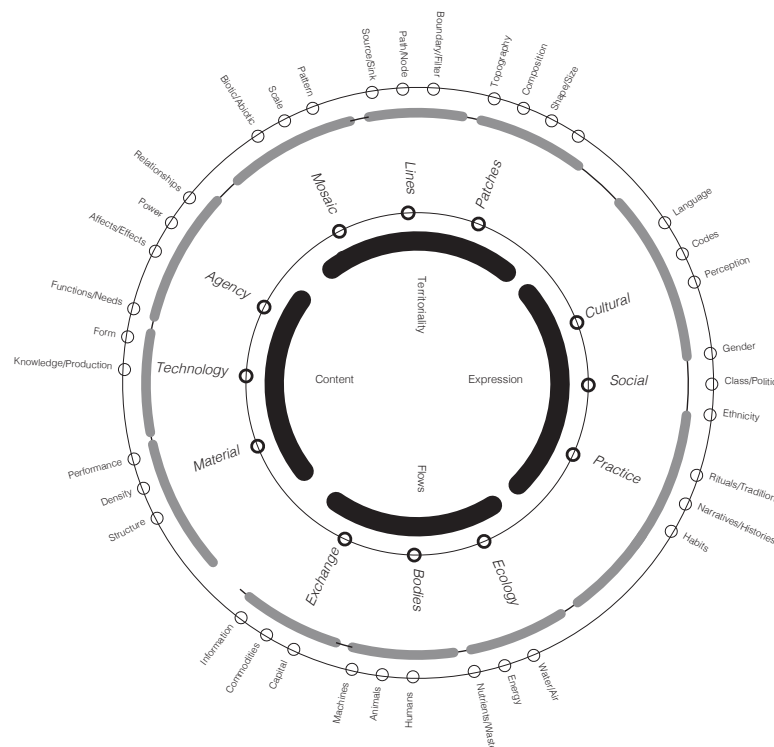


Fig. 03: The Design Studio Matrix with its three rings, from the inside: families, categories and qualifiers

The DSM is based on the concept of assemblage⁶ developed by Deleuze and Guattari (1987), and outlined by Livesey (2010) in *The Deleuze Dictionary*. It consists of four families (inner circle) each with three categories (middle circle) and further qualifiers (outer circle). Together, the families address spatial structure and place, temporality and motion, material culture and process, representation and cultural practices. The vertical and horizontal axes each bind two families together (Territoriality and Flows; Content and Expression). This enables a flexible use of the DSM across the whole of the design process, from the exploration of an issue or problem to the production of prototypes and the evaluation of solutions.

The DSM is supported by a Glossary (see Appendix) that explains the four DSM families and their defining categories. This glossary, together with the DSM graphic, was included in the design studio course handbooks and handed out to students at the beginning of the semester. Students were briefed by instructors on how to utilize the DSM. This meant that although the three design studio courses included in this study used the same DSM and glossary, the one developed in summer 19, the application of the DSM varied. However, all three courses utilized diagrams (drawings that explain rather than represent, and show arrangements and relations) to visualize work and learning processes, decisions and outcomes, allowing for some comparison. However, only the diagrams of EVDP 644 B02 2020 and EVDP 616 are utilized for this study as these diagrams did not form part of any assignments.

The next chapter, 3. Research Strategy, outlines the strategy, the overall plan, for conducting the research and collecting the data.

⁶ *Assemblages are complex constellations of objects, bodies, expressions, languages, qualities, and territories that come together to create new functions (a new territorial/spatial organization, a new institution, a new behavior, etc.) (Livesey, 2010).*

3. RESEARCH STRATEGY

The research project was framed as action research (Lewin, 1946) because it aimed at generating transformative change, a redefinition of design education pedagogy and design studio learning, through the simultaneous process of taking action and doing research, linked together by critical reflection. Hence, the DSM that was used in this study is not final but rather a work in progress that has already been developed further based on the outcomes of this study (Livesey, Dall'Ara, Neuhaus, Abegglen & Tyler, forthcoming).

Research Methodology
=
action research

Hence, a mixed (or multi) method (Cresswell, 2014; Hesse-Biber & Johnson, 2015; Plano Clark & Ivanova, 2016; Watkins & Gioia, 2015) research approach was taken, with the aim of capturing not only students' use of the DSM and their attitudes towards the DSM, but also the learning enabled. The following questions thereby built the focal point:

- What do you think about the DSM?
- What is positive/challenging about it?
- Does the DSM help you understand the design process?
 - If yes, in what way?
 - If not, why not? What is missing?
- How are you using the DSM in the design process?
- Is the DSM useful for you to develop your design project?
 - If yes, in what way?
 - If not, why not? What is missing?
- Does the DSM help you keep track of your learning?
 - If yes, how?
 - If not, why not? What is missing?
- What would make the DSM even better/more useful to manage the design process/for working on design projects?

3.1 Methods and Methodology

The data collection method for the DSM research project included questionnaires, focus group discussions, semi-structured interviews and in-class observations.

Research Methods
=
questionnaires + discussions/interviews + observations

In addition, for the 2020 professional planning design studio course EVDP 644 B02 and the 2020 planning course EVDP 616, diagrams, completed by students, were collected and analyzed. Furthermore, the responses provided by students in the termly University course evaluation survey, the Universal Student Ratings of Instruction, were included in the data analysis if they focused on the DSM.

3.1.1 Questionnaires

The questionnaires (Scott & Morrison, 2005; Payne & Payne, 2004) asked students about their use of the DSM and their attitudes towards it, and also about the DSM itself, its terminology, structure and layout as well as its 'mechanics'. The majority of the questions were closed-ended with a predefined list of answer options, although at the end, all of the questionnaires left space for students to leave comments. The questionnaires also asked students for which program they were registered, what year of study they were in, what gender they were, what age group they belonged to and what their experience of working on design projects apart from university studies was. It was hoped that the information provided in regard to these additional questions would allow for comparing the answers provided to the other questions (e.g. comparing the answers given by male students with those given by female students). However, as most students left these additional questions blank, such a comparison was not possible.

The questionnaires were handed out on crit days, which ensured that most students who agreed to complete them were able to receive them. However, while this approach ensured that the questionnaires could be distributed to participating students, it posed the challenge of it being an 'assessment day'. This hindered some of the students in completing the questionnaires as their focus, quite understandably, was elsewhere. Despite this, the overall completion rate of the questionnaires was high, with the majority of participating students returning them.

3.1.2 Focus Group Discussions/Semi-structured Interviews

Originally, focus group discussions (Barbour, 2018; Morgan, 1997; Hennink, 2014) were proposed as one of the data collection methods for this study. While most of the interviews were conducted in this format, interviews were also carried out with individual students. The reason for this was that some students felt more comfortable talking one-to-one while others found it tricky to attend an interview session that fitted both their and their peers' schedule. The questions asked in the focus group discussions and the semi-structured interviews centered around students' attitudes towards the DSM. Further questions asked students about design studio learning as well as their educational and professional background. While these additional questions revealed interesting answers, they were often difficult to contextualize and compare. Hence, only a few of these responses are presented in this report. However, in addition to the discussions and interviews, the answers provided by students in the standardized University course evaluation survey that directly related to the DSM were included in the analysis as they were deemed useful for providing further insight into students' attitudes. These responses are presented separately from the discussion/interview data, and are clearly labeled as course evaluation feedback (see 4. Findings).

Most of the discussions and interviews were held in the design studio where students attended their classes. They were held either before or after the formal input and (desk) crit sessions. Sometimes, the interviews were also held in spaces adjacent to the design studio classroom as this allowed for a more private conversation. Discussions and interviews with students attending EVDP 644 B02 2020 and EVDP

616 2020 that were either partially or fully delivered online were also conducted via video conferencing using University approved software. All of the focus group discussions and interviews were audio-recorded and later transcribed for analysis.

3.1.3 Observations

In addition to the questionnaires and discussions/interviews, in-class observations (Angrosino, 2007; Smart, Peggs & Burrige, 2013) were conducted in EVDS 620/EVDA 782.01 and EVDP 644 B02. These observations focused on the work undertaken in the design studio that involved the DSM. Lectures and formal input sessions by instructors, as well as crit sessions and ‘showcases’ were observed. The observations followed a simple observation schedule to allow for flexibility in both the data observation and data recording.

Date/time Class/classroom	Use of Matrix >Description of situation / activity	Key interactions in regard to Matrix >Instructors >Students >Instructors/ students	Key discussions/ comments in regard to Matrix >Instructors >Students >Instructors / students	Additional notes, comments, initial reflections

Fig. 04: Observation Schedule

Students were always informed when observations took place (overt research). When carrying out the observations, great care was taken not to interfere with the course instruction. Yet, a certain element of interference, as with all observational research methods, could not be avoided as the presence of an additional person, the researcher, was enough to draw attention from both students and instructors. In addition, not everything could be observed so there is a risk that some things were missed. And, similarly, there is a danger that what was observed has been misinterpreted. Hence, the observational data in this study is used as an add-on, complementing the information gathered in the questionnaires and discussions/interviews.

3.2 Data Analysis

The data collected - the questionnaires, the focus group discussions, the semi-structured interviews, the observations, the diagrams and the course evaluation survey responses - was analyzed separately for each course. The results are presented in the findings chapter (Chapter 4).

The data analysis followed the idea of ethnographic research (Ellen, 1987; Gobo, 2008; Strauss & Corbin, 1990), where the understanding of the whole and the contribution of particular elements to understanding the whole is more important than the understanding of individual elements; the aim was to enable a meta-discussion about the usefulness of the DSM for design studio learning and teaching. Hence, the goal of the data analysis was to cluster similar information, or, in the case of this study, similar attitudes and experiences. This approach could be summed up as “polythetic analysis”,⁷ as described Johnson (2019, May 23): “...a way in which the counterpoint might be represented and compared in a way that acts as a kind of ‘imprint’ of meaning-making”. In addition, in the analysis of the data, more emphasis was based on the data that would enable the DSM research team (and later the instructor team) to ‘take action’ and develop the DSM further.

Data Analysis

=

polythetic

The focus group discussions, semi-structured interviews, observations and opened-ended questions of the questionnaires were coded to identify topics, ideas and patterns of meaning that came up repeatedly, following the method of thematic analysis (Guest, MacQueen & Namey, 2012). The closed questions in the questionnaires were analyzed using statistical analysis software with the results presented as charts. The diagrams were visually analyzed and compared with the comments written by students in relation to their diagrams. The responses in the course evaluation surveys were selected according to their relevance to the research and then analyzed for their content.

3.3 Ethics

For this study, particular care was taken to adhere to research ethics, the standards, protocols and procedures outlined by the University of Calgary⁸ and also social/educational research more generally. Ethical approval was sought from the University of Calgary Conjoint Faculties Ethics Board and granted in August 2019. The study was approved under the number REB19-0162_REN1.

Ethics

=

informed consent + voluntary participation + confidentiality

Participation in the research was completely voluntary. Students could opt in and out of particular research elements and they could refrain from answering any questions asked as part of the research without giving a reason for doing so. They could also withdraw from the study up until the end of the data collection process in December 2020 without any consequences, although they were made aware that the information provided in the group discussions may be difficult to remove as it is intertwined with that of other participants.

⁷ See also Alfred Schutz's publications on music (*Fragments on the Phenomenology of Music, Making Music Together: A Study in Social Relationship*) that elaborate on the concept.

⁸ See: <https://research.ucalgary.ca/conduct-research/ethics-compliance/human-research-ethics>

To ensure their confidentiality, no names of participating students are revealed. The data collection and data analysis were kept completely separate from the course instruction and evaluation. The instructors were not informed about which students took part in the research and which ones did not. When distributing the questionnaires, they were handed out to all students so those that had opted out could either discard them or hand them back empty. The focus group discussions and interviews were held without instructors present. If students felt comfortable talking with other students around, and pandemic University regulations allowed them to do so, the discussions and interviews were held in the classrooms. Otherwise, they took place in separate spaces or online. The students attending focus group discussions were made aware that other students attending the discussion would become aware of their participation in the research. Most students were fine with this as it did not reveal whether they had participated in other research elements. No data was collected for students that opted out of the research or particular elements of the research.

All students were fully informed about the research and its aims. They were given an informed consent form that contained an overview of the study and its aims, and in which they could indicate whether and in which elements of the research they would like to participate. The form also provided the contact details of the researcher and the research ethics analyst at the University of Calgary Research Services Office as well as those of the instructor(s) on their course, should they have any questions and/or concerns.

Your signature on this form indicates that 1) you understand to your satisfaction the information provided to you about your participation in this research project, and 2) you agree to participate in the research project:

Your signature on this form indicates that 1) you understand to your satisfaction the information provided to you about your participation in this research project, and 2) you agree to participate in the research project:

☐ The classroom observations

☐ The focus group discussions

☐ The questionnaires

____ Date

____ Signature

Fig. 05: Informed Consent Form

The next chapter, 4. Findings, presents the findings of the Design Studio Matrix research project, in relation to each course.

4. FINDINGS

The DSM was embedded in a total of six design studio courses at SAPL whereby three of those design studio courses (EVDS 620/EVDA 782.01 2019, EVDP 644 B02 2020, EVDP 616 2020) were formally included in this study for evaluation. Together, these courses had a total of 53 students registered, with 38 students participating fully in the research and 3 students participating partially.

Design Studio Course	Year/Semester	Instructor(s)	Number of Students Registered	Course Included in Study/ Evaluation	Number of Students Participating
EVDP 616 Planning course	Fall 2020	Dr. Fabian Neuhaus	10	Yes	5f/1p
EVDP 644 B02 Advanced Professional Planning Studio	Winter 2020	Dr. Fabian Neuhaus	11	Yes	9
ARST 444/582 Studio II in Architecture	Winter 2020	Dr. Graham Livesey	12	No	-
EVDS 620 Urban Design Studio/EVDA 782.01 Senior Architecture Design Studio	Fall 2019	Hal Eagletail, Dr. Graham Livesey, Dr. Fabian Neuhaus,	32	Yes	24f/2p
EVDP 644 B02	Winter 2019	Dr. Fabian Neuhaus	9	No	-
EVDS 620 Urban Design Studio/EVDA 782.01 Senior Architecture Design Studio	Fall 2018	Dr. Enrica Dall'Ara, Dr. Graham Livesey, Dr. Fabian Neuhaus	26	No	-

Fig. 06: Research Sample

The participation of students according to discipline and gender was as follows for each course:

EVDS 620 Urban Design Studio/EVDA 782.01 Senior Architecture Design Studio 2019:

Total No of Students Registered	Subject			Gender	
	Architecture	Planning	Landscape	Male	Female
32	16	6	10	18	14

Fig. 07: EVDS 620/EVDA 782.01 2019 Registered Students

Total No of Students Participating in Research	Subject			Gender	
	Architecture	Planning	Landscape	Male	Female
24f/2p	12f/2p	4	8	14f/2p	10

Fig. 08: EVDS 620/EVDA 782.01 2019 Participating Students

EVDP 644 B02 Advanced Professional Planning Studio 2020:

Total No of Students Registered	Gender	
	Male	Female
11	5	6

Fig. 09: EVDP 644 B02 2020 Registered Students

Total No of Students Participating in Research	Gender	
	Male	Female
9	4	5

Fig. 10: EVDP 644 B02 2020 Participating Students

EVDP 616 Planning Studio 2020:

Total No of Students Registered	Gender	
	Male	Female
10	6	4

Fig. 11: EVDP 616 2020 Registered Students

Total No of Students Participating in Research	Gender	
	Male	Female
5f/1p	1f/1p	4

Fig. 12: EVDP 616 2020 Participating Students

4.1 Data Overview

The data collected for each course is slightly different as courses differed not only in their nature, but also in terms of their DSM use.

Design Studio Course	Data				
	Discussions/ interviews	Questionnaires	Observations	Diagrams	Course Evaluation
EVDP 616 Planning course	X		X	X	X
EVDP 644 B02 Advanced Professional Planning Studio			X	X	X
EVDS 620 Urban Design Studio/EVDA 782.01 Senior Architecture Design Studio	X	X	X		X

Fig. 13: Data Overview

The exact data collected for each course is outlined in the following sections.

4.1.1 Data EVDS 620/EVDA 782.01 2019

The data collected in the interdisciplinary design studio course EVDS 620/EVDA 782.01 2019 consists of questionnaires, focus group discussions, semi-structured interviews, in-class observations and course evaluation survey responses.

Three questionnaires were handed out⁹ and a total of 45 questionnaires were completed by participating students:

Total No of Questionnaires Completed	Total No of Questionnaire 1 Completed	Total No of Questionnaire 2 Completed	Total No of Questionnaire 3 Completed
45	15	13	17

Fig. 14: EVDS 620/EVDA 782.01 Questionnaires Completed

In addition, 10 focus group discussions/interviews were held with a total of 20 student participants:

⁹ The questionnaires were handed out on the following dates: 4th of October 2019 (crit session, Assignment 02/Part B), 8th of November 2019 (crit session, Assignment 03/Part B) and 11th of December 2019 (final crit, Assignment 4).

October 2019: First Set of Focus Groups/ Interviews	November 2019: Second Set of Focus Groups/ Interviews	December 2019: Third Set of Focus Groups/ Interviews
5 (2 focus group discussions, 3 semi-structured interviews) with a total of 7 students (6 females, 1 male)	3 (2 focus group discussions, 1 semi-structured interview) with a total of 6 students (4 females, 2 males)	2 (2 focus group discussions with a total of 7 students (3 females, 4 males)

Fig. 15: EVDS 620/EVDA 782.01 Discussions/Interviews Completed

Furthermore, 12 in-class observations were carried out.¹⁰

4.1.2 Data EVDP 644 B02 2020

The data collected for the professional planning design studio course EVDP 644 B02 2020 consists of diagrams, in-class observations and course evaluation survey responses whereby the in-class observations had to be suspended when the course was moved online in March 2020 because of Covid-19 pandemic restrictions. Hence, the observation data for this course is limited.

A total of 12 diagrams per student group were collected, seven in print format and five in digital format. The digital diagrams are discussed in this report as they allowed for a direct comparison between them and those completed by students in EVDP 616.

In addition, five in class-observations were carried out on desk crit days.¹¹

4.1.3 Data EVDP 616 2020

The data collected in this studio consists of diagrams, semi-structured interviews conducted via web/video conferencing and course evaluation survey responses.

A total of 11 iterations of the diagram were digitally recorded in this studio. Eight are based on teamwork and two are individual reflection submissions. The group diagrams were used for this research as they are directly comparable with the ones submitted by the students in EVDP 644 B02.

In addition, a total of five semi-structured interviews were conducted towards the end of term in December 2020:

Total No of Interviews	Gender	
	Male	Female
5	1	4

Fig. 16: EVDP 616 Interviews Completed

¹⁰ The observations were carried out on the following dates: 6th of September 2019, 23rd of September 2019, 27th of September 2019, 1st of October 2019, 4th of October 2019, 11th of October 2019, 15th of October 2019, 18th of October 2019, 1st of November 2019, 8th of November 2019, 22nd of November 2019 and 11th of December 2019.

¹¹ The desk crit observations were carried out on the following dates: 29th of January 2020, 4th of February 2020, 11th of February 2020, 25th of February 2020 and 3rd of March 2020.

4.2 Results EVDS 620/EVDA 782.01 2019

The data collected in the interdisciplinary design studio course EVDS 620/EVDA 782.01 2019 (questionnaires, focus group discussions, semi-structured interviews, observations and course evaluation responses) revealed the following:

4.2.1 EVDS 620/EVDA 782.01 Questionnaire Results

The analysis of Questionnaire 1 revealed that the majority of the students, even with only a short introduction to the DSM, thought that its structure was easy to understand. Nevertheless, they felt that they understood the Flows family best out of the four DSM families. On the level of the categories, they indicated that it was a bigger challenge to get to grips with the categories Mosaic and Agency and also Social. The majority of students (by a small margin) said that they found the DSM useful for the analysis of the project site (as required for Assignment 2). At the same time, they were unsure whether the mapping (or diagramming) of the findings of their site analysis against all twelve of the DSM categories was useful. The results show that the majority of students said that they would consider applying the DSM to a different context or project, with some students already applying it in a different class by themselves. Those who said that they would not apply it elsewhere or were unsure found some of the DSM terminology confusing and the possibilities that the DSM offered somewhat restrictive.

Q1:Q01

The DSM has 4 main families divided into 12 categories which are branching out into another 36 qualifiers. Do you think this structure is easy to understand? Please indicate on a scale from 1 (very easy to understand) to 5 (very difficult to understand). [tick one]

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

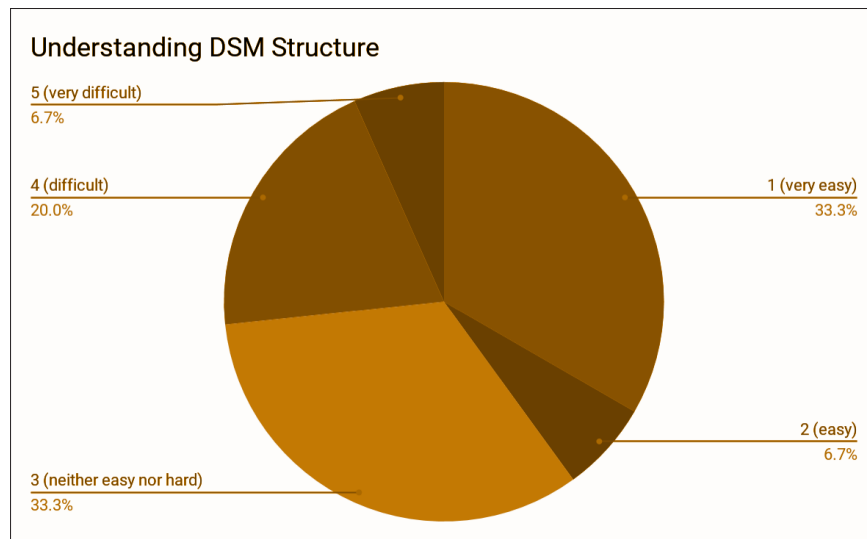


Fig. 17: EVDS 620/EVDA 782.01 Questionnaire 1, Question 01 Answers

Q1:Q02

If you consider the four main families - Territoriality, Expression, Flows, Content - which one do you understand best (the category you have the least questions about)? [tick one]

- ☐ Territoriality ☐ Expression
☐ Flows ☐ Content

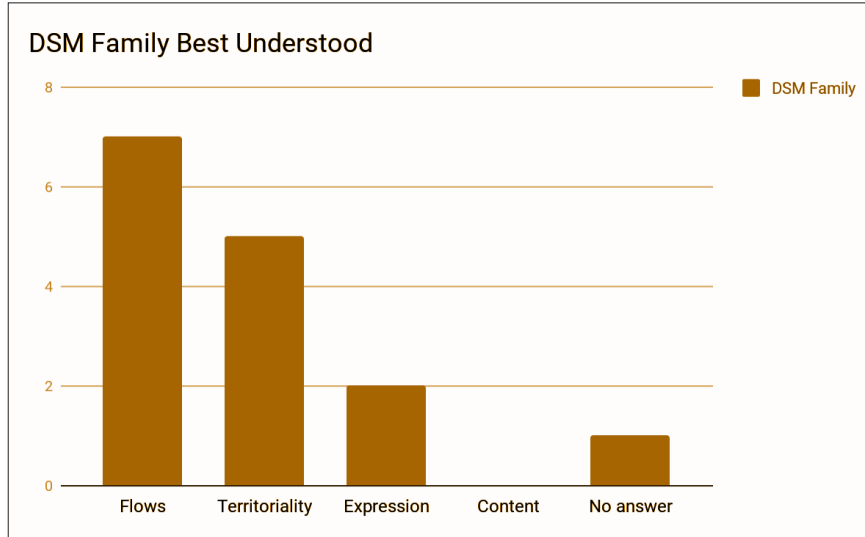


Fig. 18: EVDS 620/EVDA 782.01 Questionnaire 1, Question 02 Answers

Q1:Q03

Which DSM family(ies) / category(ies) do you struggle to understand (if any)? [list all]

- ☐ _____ ☐ _____ ☐ _____
☐ _____ ☐ _____ ☐ _____

[Note: Students could list several families/categories]

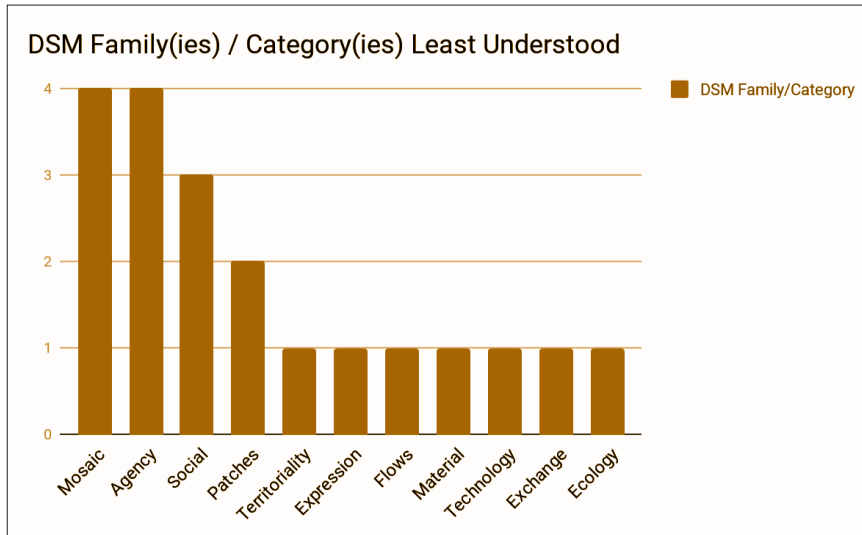


Fig. 19: EVDS 620/EVDA 782.01 Questionnaire 1, Question 03 Answers

Q1:Q05

The second assignment (Assignment 2) asked you to utilize the DSM to analyze “the site” and its context. Do you think the DSM has been useful in assisting you with the analysis?

[tick one]

- ☐ Yes
☐ No
☐ I am not sure

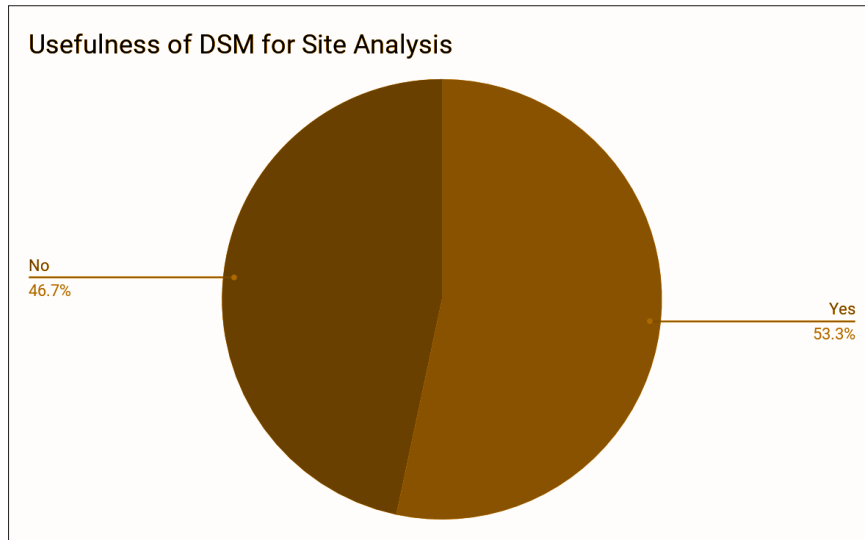


Fig. 20: EVDS 620/EVDA 782.01 Questionnaire 1, Question 05 Answers

Q1:Q06

How useful do you think it was to “map” the 12 sub-categories (Mosaic, Lines, Practices - Cultural, Social, Practice - Ecology, Bodies, Exchange - Material, Technology, Agency) to move on with your project? Please indicate on a scale from 1 (very useful) to 5 (useless). [tick one]

- ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

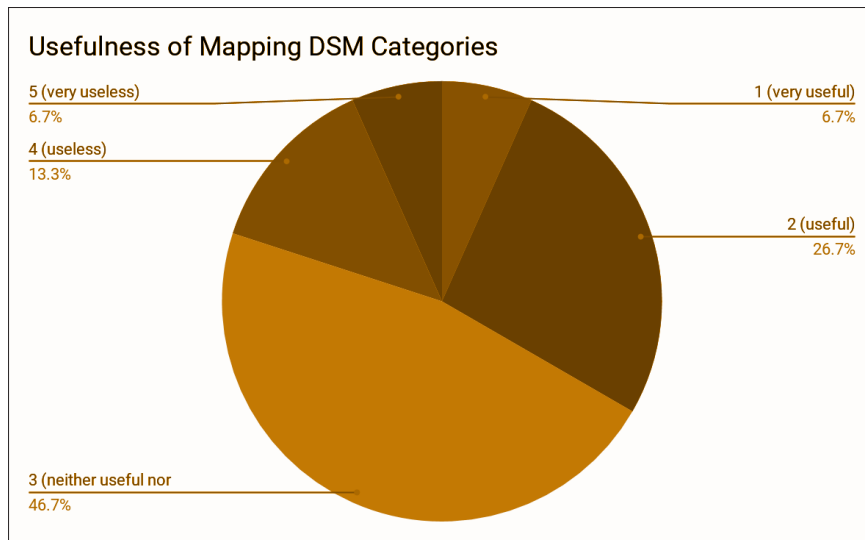


Fig. 21: EVDS 620/EVDA 782.01 Questionnaire 1, Question 06 Answers

Q1:Q07

Would you consider applying the Matrix in a different context or project? If yes please give details. [continue below if necessary]

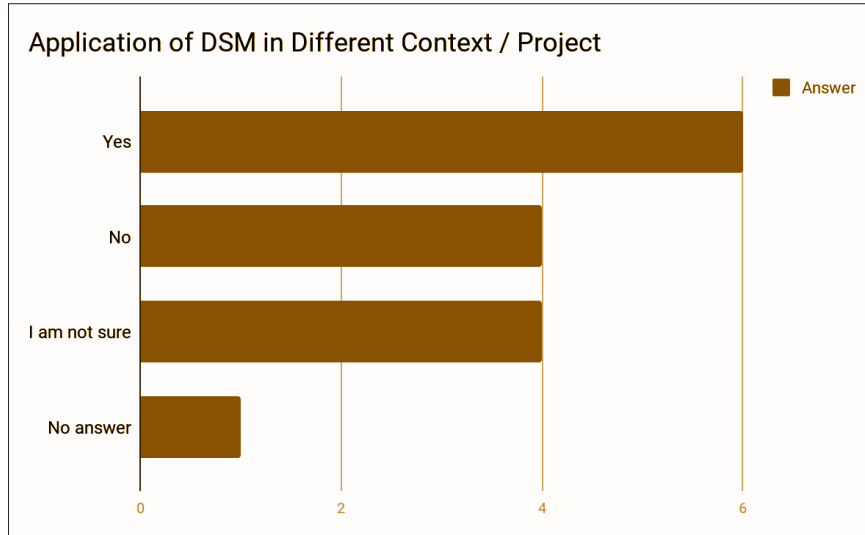


Fig. 22: EVDS 620/EVDA 782.01 Questionnaire 1, Question 07 Answers A

☐ Yes

"It helped me think about topics of analysis in different ways, and also opened my eyes to new ways of analysis (like agency, practice, exchange). I anticipate using the Matrix for much of my future site analysis."

"Already have in other classes."

"Yes, if the audience is familiar with the concept".

"I would apply it to a theoretical project."

☐ No

"The only reason it was useful in this project is because we are directed to use the terms within the Matrix so it was somewhat a convenient tool to reference if I forgot what category a term was in."

"It feels lacking in explorations of change of site over time."

☐ I am not sure

"Some of them, yes, but not all of them. Some terms are extremely hard to understand, confuse us instead of help us moving forward."

"Maybe, but certainly opened my mind in terms of finding the [porches] to a project".

"I found the more regimented use of the Matrix less helpful than with my part experience of it."

"Maybe. I think the Matrix is either too broad in certain categories or too specific in other categories."

Fig. 23: EVDS 620/EVDA 782.01 Questionnaire 1, Question 07 Answers B

The analysis of Questionnaire 2 showed that when working on Assignment 3b, the development of a proposal, students considered the DSM Flow family as most important for their project, the category they said they best understood in Questionnaire 1. At the same time, they felt that the Content family was least relevant for their work; none of the students chose this family when asked about the family they best understood in Questionnaire 1 (although it was not mentioned as the least understood category in that same questionnaire). It appears that while developing their project proposals, students (or student groups) stuck with the DSM family they felt they understood. When asked if they felt the DSM would be useful for developing their projects further, they said they were unsure.

Q2:Q02

If you consider the four Matrix families - Territoriality, Expression, Flows, Content - which is the most relevant for your (group) proposal (Assessment 3b)? [tick one]

- ☐ Territoriality ☐ Expression
☐ Flows ☐ Content

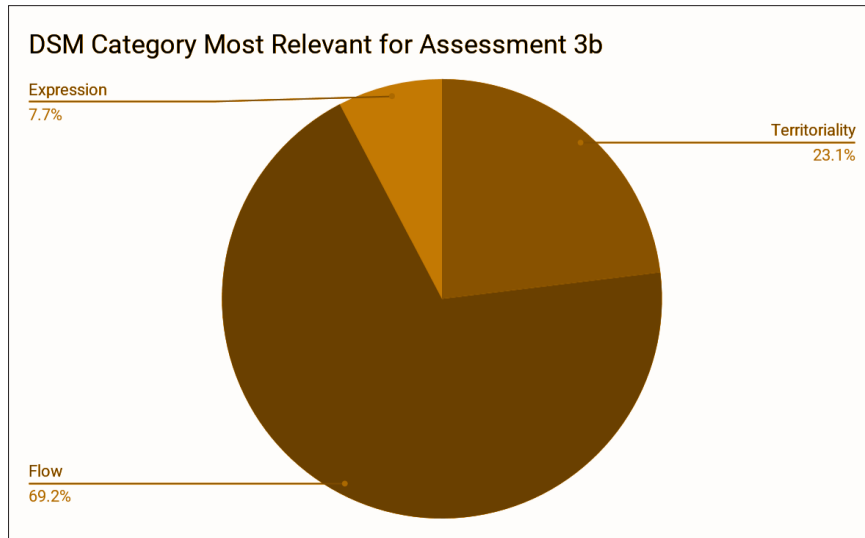


Fig. 24: EVDS 620/EVDA 782.01 Questionnaire 2, Question 02 Answers

Q2:Q03

Which of the four DSM families - Territoriality, Expression, Flows, Content - is the least relevant for your (group) proposal (Assessment 3b)? [tick one]

- ☐ Territoriality ☐ Expression
☐ Flows ☐ Content

[Note: One student selected two families]

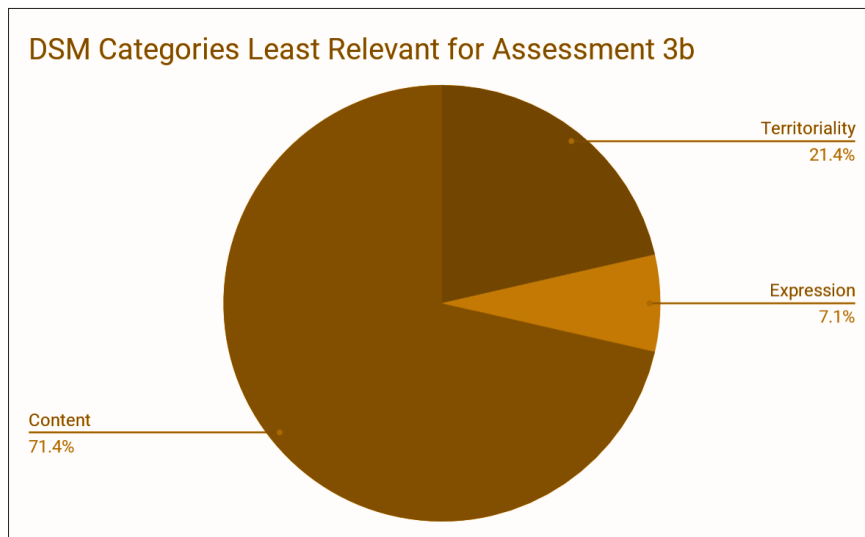


Fig. 25: EVDS 620/EVDA 782.01 Questionnaire 2, Question 03 Answers

Q2:Q04

Looking ahead, do you think the DSM will help you develop your proposal/project/idea further?

- ☐ Yes
☐ No
☐ I am not sure

[Note: One student selected two answers]

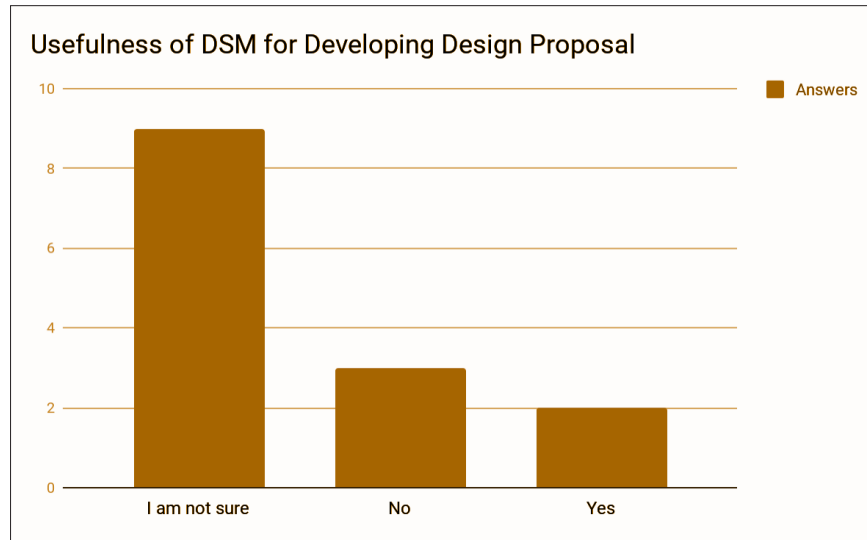


Fig. 26: EVDS 620/EVDA 782.01 Questionnaire 2, Question 03 Answers

Students clearly felt that the DSM Flows family was the one they referred to the most throughout the semester and their project development; this was the one they said they understood best in Questionnaire 1 and the one they mentioned as the most important for Assignment 3b in Questionnaire 2. They were still undecided whether the DSM was useful for developing their ideas/projects and thus they felt that they would not use the DSM in future projects. Although students were unsure about the usefulness of the DSM, most of them felt that the DSM did not need improvement. However, the comments provided revealed that students did struggle with the terminology. They found it 'limiting'. Some students also wished for a different layout of the DSM and more 'lectures' on it.

Q3:Q01

You have nearly completed the Design Studio course. Looking back, how useful was the DSM for you to develop your ideas? Please indicate on a scale from 1 (extremely useful) to 5 (not at all useful). [tick one]

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

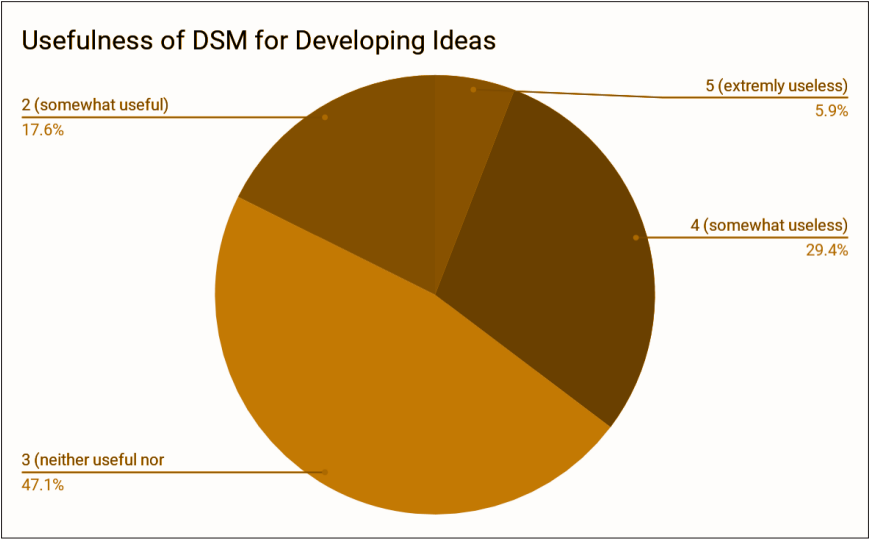


Fig. 27: EVDS 620/EVDA 782.01 Questionnaire 3, Question 01 Answers

Q3:Q02

If you consider the four DSM families - Territoriality, Expression, Flows, Content - which is the one you referred to most in your work/projects throughout the semester? [tick one]

☐ Territoriality ☐ Expression
☐ Flows ☐ Content

[Note: One student selected two families]

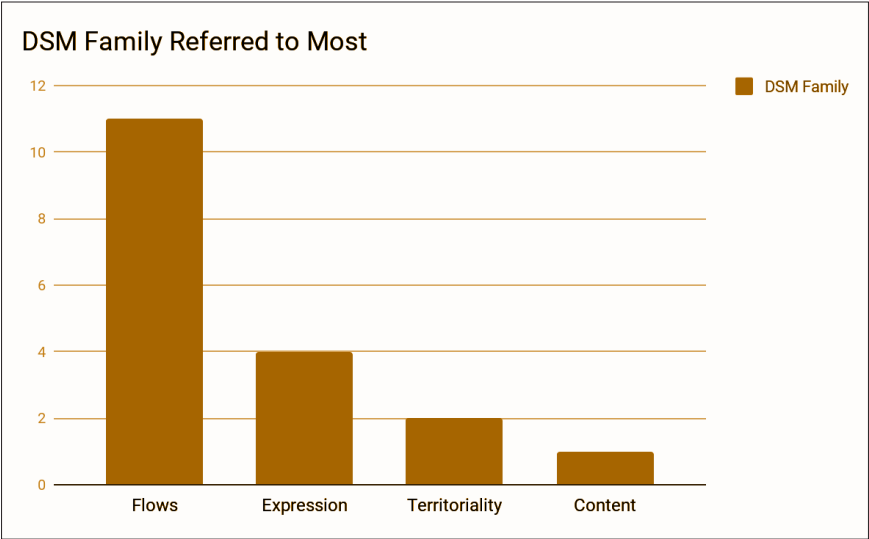


Fig. 28: EVDS 620/EVDA 782.01 Questionnaire 3, Question 02 Answers

Q3:Q03

Is there anything you would change to improve the Matrix? If yes, what would that be? [tick one - explain]

☐ Yes

☐ No

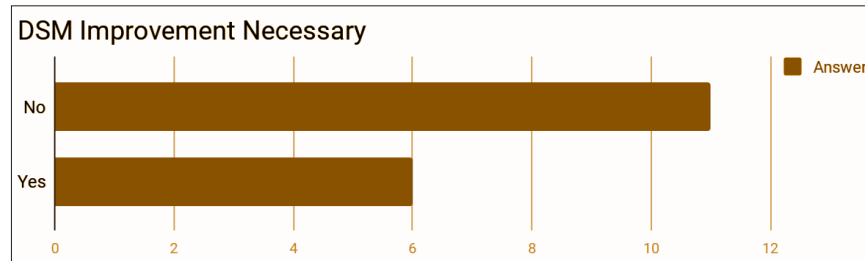


Fig. 29: EVDS 620/EVDA 782.01 Questionnaire 3, Question 03 Answers A

☐ Yes

☐ No

“More comprehensive lecture about it.”

“A couple of words don’t work, i.e. exchange isn’t broad enough.”

“Words are limiting to the process.”

“A little bit resistance, to follow the exact terminology was a hindrance. Maybe a handful of [fluency]) in the terms would be helpful.”

“Re-format. Should not be circular - it branches outward, like a fractal.”

“Design of Matrix as presented by group D of final crit.”

Fig. 30: EVDS 620/EVDA 782.01 Questionnaire 3, Question 03 Answers B

Q3:Q04

Looking ahead, do you think you will use the Matrix again - in another project or in your professional practice? [tick one]

☐ Yes

☐ No

☐ I am not sure

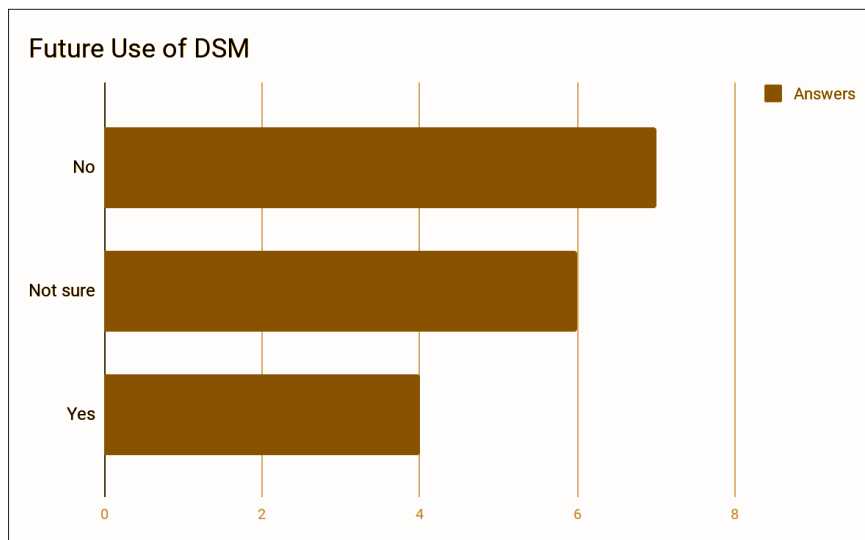


Fig. 31: EVDS 620/EVDA 782.01 Questionnaire 3, Question 04 Answers

4.2.2 EVDS 620/EVDA 782.01 Discussion/Interview Results

The focus group discussions and interviews with students confirmed the questionnaire findings. Students found the DSM useful in the early stages of their project and less so later on, although some students were more critical of the tool than others. For example, female Participant 1 said, “For me, personally, it does not have a lot of benefits” while female Participant 3 said, “The Matrix itself, as a tool, it has been useful”. Interestingly, many students commented on the form and structure of the DSM, seeing it more as a list of related concepts and terms rather than a circular diagram with segments that overlap and intersect, a perspective that was put forward by the instructors. Being part of a cross-cultural course and working on a cross-cultural topic also made them question the DSM terminology, and they clearly attributed it to a Western perspective. When asked about future usage of the DSM, most of the students interviewed, similar to those who completed the questionnaires, were unsure.

Selected responses that illustrate the above are presented in the following.

Semi-structured Interview 1/Female Participant 1 (October 2019):

Female 1 said that, on the one hand, she found the DSM not particularly useful, but, on the other, it did help her reference her work. She said that while the tool may be less biased than other tools, she thought that the terminology used was clearly influenced by a Western perspective. She felt that when working with her group on the proposal she would have preferred to only focus on one DSM family rather than the whole of the DMS, and to learn about the rest either through their peers or lectures. She also said that she would have preferred the DSM to be presented as a list.

	General
“It’s just a different way of organizing the terms. It has less of a bias than a system where you would have a header and a sub-header and then the description.”	“For me, personally, it does not have a lot of benefits.”
“It is a convenient tool to quickly reference things. When I am working on whatever and I am talking about one of these outside terms and then, wait... Then you can check. Oh, it is this one and this is part of this one.”	
	DMS Category Rating
“I am focusing on the Flows category. I thought it is kind of interesting. Just from my base understanding, I thought it could be interesting to compare a Western, a Western settler view with an Indigenous view in that category.”	
	Terminology
“The glossary is definitely useful. The one thing we noticed as a group, I would say, is that it is clearly done through a Western lens.”	
“We would get more out of it... Instead of every group doing every term, we could have had a bunch of groups doing only these or only these, and then you get a lot more out of it. Or, we could have had a bunch of lecturers on it.”	

Fig. 32: EVDS 620/EVDA 782.01 Female 1, Selected Interview Answers

Semi-structured interview/Female Participant 2 (October 2019):

Female Participant 2 was very critical of the DSM, describing the tool as limiting and restrictive. She also struggled to make sense of the glossary, not quite understanding its purpose and the terminology within it. Similar to female Participant 1, she would have preferred to focus on a DSM family right from the start rather than having to explore all four DSM families. Furthermore, she indicated that she saw little value in the regular mapping of her ideas. Female Participant 2 also said that she would have preferred the DSM to be presented as a list rather than a circular diagram.

	General
"They say you can interpret it but it is at the same time it is a little bit limiting."	
"I don't personally understand as to why to put it into a circle. It could just be four categories, a list."	
	DMS Category Rating
"There is some repetition."	
"There is some where you already know what the map is gonna be."	
"There maybe is value in doing it but it would be nice if we could pick the topics right away and focus on that."	
	Terminology
"There is these definitions, of all these terms... You get a kind of understanding what it is but then you often go in another direction. I am not sure if writing it all down is so helpful then."	
"They reference so many texts or titles. I don't really know what the point of that is. For example, this is from 1999. I am not sure if this is relevant."	
"I don't want the terms to limit me."	
	Future Usage
"I don't think I will use the Matrix in the future. I can't really see myself using it."	

Fig. 33: EVDS 620/EVDA 782.01 Female 2, Selected Interview Answers

Semi-structured interview/Female Participant 3 (October 2019):

Female Participant 3 was positive about the DSM itself while she was very critical of the design studio course. She thought that the DSM provided a 'common ground' to discuss ideas. However, similar to female Participants 1 and 2, she was unsure about the visual representation of the DSM. However, rather than seeing it as a list, like female Participants 1 and 2, she saw it as a sort of mind map with different branches. However, not all of the DSM terminology made sense to her and she wondered why certain terms had been grouped/arranged together. Also, some of the terms were described too superficially for her liking and were grounded too much in a Western perspective. She was unsure whether she would use the tool again and argued that other people would need to be introduced to it before it could become useful.

	General
"To be honest, the most of the struggle has not been with the Matrix itself but the fact of having two profs and having to find out what exactly the assignments are."	
"The Matrix itself, as a tool, it has been useful. I feel it gives us a common reference we all understand and can use as a shorthand."	
"As we are getting into a deeper use of it and are trying to explore how it is interconnected... I don't know. The way they structured it... The way that it has been presented as a circle is strange to me because it seems to me these things just branch off and branch off separately."	
	Terminology
"I can understand why terms are clustered together, because they all branch out. But then having information and structure together... Is there a reason for that? Is there a reason they have been arranged the way they have?"	
"The Glossary... It is funny because many start off with a kind of we looked it up in the dictionary definition. That's fine. For example, it says, lines in geometry connect to dots and... That's fine. But here in the studio we go far beyond that."	
"Another thing, we have discussed among us in groups a lot, is the idea that a lot of these definitions come from a clearly Western perspective."	
	Future Usage
"I think ... It is interesting. Part of the challenge is that these terms might mean different things to different people.. Having definitions is good, at least to make sure we are on the same page about it. But at the same time it takes a little bit of investment to read that for you to understand. Pulling this out in a different context... There would be an amount of explaining the tool before you can use it but once people are familiar with it it is a nice shorthand way of referring to concepts."	

Fig. 34: EVDS 620/EVDA 782.01 Female 3, Selected Interview Answers

Focus Group Discussion/Female Participant 4 & Male Participant 1 (October 2019):

The two students, a female and a male, in this focus group discussion were critical of the DSM. In particular, the female participant expressed that she saw little benefit for herself in the DSM. Both students said that they had adapted the DSM to fit their needs in their respective groups. Despite this, both female Participant 4 and male Participant 1 said that working with the DSM and negotiating its use with peers was beneficial for their learning. Male Participant 1 was not sure about his future usage, while female Participant 4 stated that she would not use it again in the future.

Male Participant 1	
General	"We are not 100% sure. We took the concept, but not all of it, just partially, we used it to create our own thing."
	"I did not take this Matrix tool and punch it into our concept. We adapted it."
	"For sure, there has been an effort to incorporate how the Matrix works... but right now, honestly, it's just there. It does not mean that I did not learn anything about design thinking. I definitely learned some stuff."
DMS Category Rating	"It is interesting to see how different people from different backgrounds approach this. I think the learning opportunity here is to meet halfway."
	"The team dynamic is the main thing that I will get out of this."
Future Usage	"Maybe in the future, there's instances where this is applicable, but I am not sure."
Female Participant 4	
General	"For our group, some of us take some concepts from the Matrix. People like me... I feel like I did not gain much from it."
	"As designers we have our own way. If we start from scratch, as designers, we have our own way of doing the site analysis. But now this is a whole new concept, and we are confused about it. We figured out it is not actually related to what we are doing."
DMS Category Rating	"You can take two drawings, two diagrams, and you can identify which one is from which discipline."
	"To understand their way of thinking is challenging."
Future Usage	"I don't think I will use the Matrix. I don't see it being beneficial for me on how I do things."

Fig. 35: EVDS 620/EVDA 782.01 Female 4 & Male 1, Selected Discussion Answers

Focus Group Discussion/Female Participant 8, Female Participant 9 & Male Participant 2 (November 2019):

The three students in this focus group felt positive about the DSM. They liked that it provided them with a structure that, in turn, gave them the freedom to explore their interests and ideas. The DSM also helped them to move their focus away from the physical aspects of their projects towards other, less tangible, elements. However, female Participant 7, female Participant 8 and male Participant 2 disagreed over some of the terminology used in the DSM, although they did find the glossary useful. Both female Participant 7 and female Participant 8 stated that they would consider future use of the DSM, and female Participant 8 had already used the tool in another class based on her own initiative. Male Participant 2, however, was not sure about future usage of the DSM.

Female Participant 7	
General	
"I think the Matrix is an excellent tool. As a tool, I think, it is great."	
"Going through your first year, like foundation, the first year of planning, you are told to do site analysis. You just look at it and you add things that already exist. And this is really boring. You trace the lines of the road to show that the road exists. I wish I was introduced to the Matrix then. I could have done so much more interesting things."	
"It is a reason for me not to look at those obvious physical components but start actually thinking about what I think is probably way more important, the social and the cultural."	
Terminology	
"I think that Exchange relates to way more things than being its own subcategory. I would say Exchange relates much more to Social and Cultural Practice than it does to Bodies and Ecology."	
"I don't like Expression. I think it should be Identity."	
Future Usage	
"It should come earlier in the course program. When I was doing site analysis, I would have felt I was actually doing something, something useful."	
"I already used it in another class. I used it for an assignment as we had to do site analysis."	
Female Participant 8	
General	
"This makes us think about the less physical things, the things we would not have really thought about. For example, I never thought about... In all our studios, I never thought about agency before or even culture in terms of the site."	
"I have way more control over what I am doing as I get to explore different aspects."	
DSM Category Rating	
"Forcing all the groups to diagram all the terms was a beneficial exercise even though some of them were difficult to draw or diagram. People started to think how to visually show this information and also how to analyse that within the context of the site."	
Terminology	
"[Female Participant 4] feels very strong with the words Expression and Exchange."	
"I don't have any issues with any of the families at all. They make sense to me."	
"I find the glossary very helpful. It is a jumping off point for understanding what each of the words mean."	
"I used it [the glossary] a lot at the start of this project."	
Future Usage	
"I can see myself using it in the future for sure. Also think that the glossary... I will use that in the future and also build upon it to build on my own. A little library of ideas."	
Male Participant 2	
General	
"I like the Matrix. It is a good tool. It does help with our project."	
DMS Category Rating	
"We did find the initial diagramming useful although later on we could have done with less of that."	
Terminology	
"The glossary is very dense."	
Future Usage	
"I am not sure but I will probably use it in other classes."	

Fig. 36: EVDS 620/EVDA 782.01 Female 7, Female 8 & Male 1, Selected Discussion Answers

Semi-structured interview/Male Participant 3 (December 2019):

Male Participant 3 was skeptical about what the DSM could help him achieve, especially when working in groups. He stated that thinking about the design process is challenging and he was not sure how much help the DSM was in this regard and whether the outcomes would be better because of the DSM. Also, he considered rating the DSM families a possibility to make sure that he was on track with the assignments rather than a possibility to reflect on the design process.

	General
"In our group, everyone has a different idea of how you should be going about design."	
"When working on projects, it is easy to forget what came before but I am not sure the Matrix can help with this."	
"This studio is interesting in the fact that it is a different process. I think we will get a lot out of it in the end."	
We learn different ways of thinking and approaching but I am not sure if the projects will be as strong as they could be if the process is different."	
	DMS Category Rating
"You are trying to look back, not necessarily at the Matrix, but the last assignment more so because the last assignment had to do so much with the Matrix. So, it is there, it is present, but we are not looking back to the Matrix specifically."	
"We all have different ideas. That's challenging."	
	Future Usage
"I think I will, maybe."	

Fig. 37: EVDS 620/EVDA 782.01 Male 3, Selected Interview Answers

Focus Group Discussion/Female Participant 11, Female Participant 12 & Female Participant 13 (December 2019):

The students that participated in this focus group were clear that they found the DSM useful at the beginning of the project and less so later on. What they found particularly challenging was the group work they were asked to do and thus the joint mapping and diagramming of the DSM families. None of the students in this group were sure about the future usage of the DSM.

	Female Participant 11
	General
"On what we are building on now, we have used it, but I personally have not worked with the Matrix since we started."	
"It definitely shaped a lot of what we're doing now."	
	Future Usage
"Maybe."	
	Female Participant 12
	General
"I feel it got us thinking in the right way but there is not much reason to go back to it at this point."	
"The main part has been to see different interconnections between the terms within it but it is so complex now that going back to it makes little sense."	
"When the assignments say we have to work with the Matrix, then we do that but for ourselves..."	
	DMS Category Rating
"The site analysis was very much focused on mapping."	
"We want to get good grades and group work is a minefield for that. The mapping has not been easy."	
	Future Usage
"I am not sure."	
	Female Participant 13
	DSM Category Rating
"It's been relatively straightforward as we were more working on larger concepts and nobody in our group said this has to go here or it has to go here."	
"It is more the project management that's challenging than the Matrix."	
"There's always the question who steps up and takes the lead."	
	Future Usage
"I don't know. It has it's pros and also it's cons."	

Fig. 38: EVDS 620/EVDA 782.01 Female 11, Female 12 & Female 13, Selected Discussion Answers

4.2.3 EVDS 620/EVDA 782.01 Observation Results

The observations in the interdisciplinary design studio confirmed a general ‘busyness’ with the DSM at the beginning of term. When introduced to the tool in the first week of the course students were enthusiastic about it and worked intensively through the DSM families, especially for their second assignment, which asked them to “develop a purpose specific version (interpretation) of the Matrix expressed in narratives and diagrams in conjunction with your analysis of the site and its content”. However, as the course progressed, students’ interest in the DSM declined. They still engaged with the tool for most of the assignments; for some of them DSM engagement was a compulsory part of the ‘deliverables’.

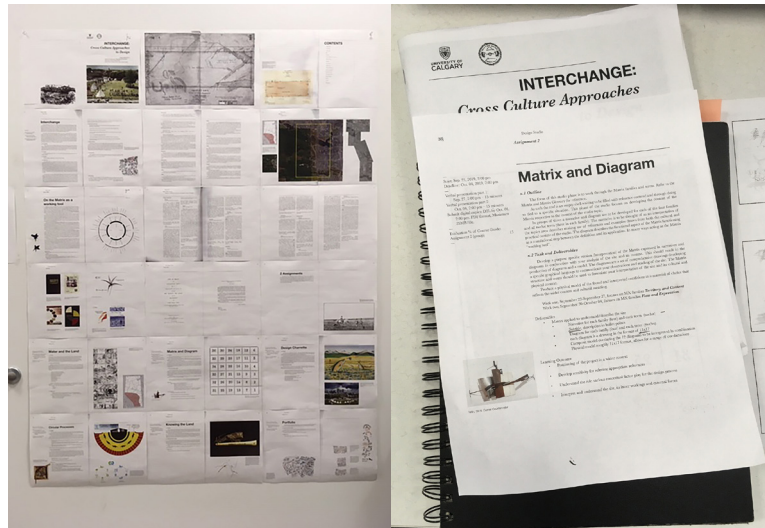


Fig. 39: EVDS 620/EVDA 782.01 Course Handbook

Students were asked to ‘map’ their project against the DSM families and to visualize their projects in relation to the DSM. This meant that students had to engage not only with the DSM families and the defining categories, but also with possible visual interpretations of their findings. This led them to produce both drawings and 3d models of various forms and structures showcasing their interpretation of the DSM.

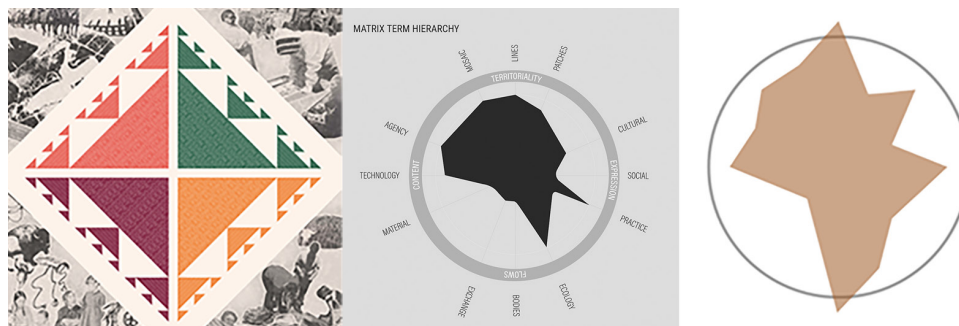


Fig. 40: EVDS 620/EVDA 782.01 Students’ Visualizations

The visualizations revealed that mapping personal ideas and design solutions against a given set of concepts/terms is challenging for students. They also confirmed that students tended to stick to those DSM families that, for whatever reason, they were more sure about (as indicated in the questionnaires and to a certain extent also confirmed in the interviews/discussions).

4.2.4 EVDS 620/EVDA 782.01 Course Evaluation Survey Results

The feedback provided by students in the end of term course evaluation survey sent out by the University confirmed the results of the questionnaires, discussions/interviews and observations although only a few responses related directly to the DSM. Students mentioned that they found the DSM useful for site analysis but then also expressed criticism. They expressed that sometimes the DSM limited them rather than supporting them. They also wished for more lectures on the tool.

	Instructor 1
	EVDA 782.01
Which specific lecture(s), topic(s), studio(s) and/or assignments(s) did you find most valuable? Explain.	
"Initial site analysis (aka the matrix) after that the matrix was of no use but the instructors made it a point to only depend on it for the rest of the term."	
"I found the second assignment (Matrix Mapping) to really be the most valuable project. The duration and direction to the project was adequate."	
	EVDS 620
Where appropriate, was the course material related to environmental design issues and to professional practice? Explain.	
"Yes. Except for Matrix."	
Which specific lecture(s), topic(s), studio(s) and/or assignments(s) did you find least valuable? Explain.	
"Matrix. It limits the way of thinking".	
Can you suggest ways this course could be improved or made more effective?	
"I understand how the Matrix could be used as a tool but unfortunately the execution of how it was taught was poor."	

Fig. 41: EVDS 620/EVDA 782.01 Course Evaluation Survey Answers Instructor 1

	Instructor 2
	EVDA 782.01
Where appropriate, was the course material related to environmental design issues and to professional practice? Explain.	
"The Matrix may not have been the most successful tool to explore the aims of the urban design studio."	
Which specific lecture(s), topic(s), studio(s) and/or assignments(s) did you find most valuable? Explain.	
"Initial site analysis (aka the matrix) after that the matrix was of no use but the instructors made it a point to only depend on it for the rest of the term."	
"I found the second assignment (Matrix Mapping) to really be the most valuable project. The duration and direction to the project was adequate."	
	EVDS 620
Where appropriate, was the course material related to environmental design issues and to professional practice? Explain.	
"Yes. Except for Matrix."	
Which specific lecture(s), topic(s), studio(s) and/or assignments(s) did you find least valuable? Explain.	
"Matrix. It limits the way of thinking".	
Can you suggest ways this course could be improved or made more effective?	
"I understand how the Matrix could be used as a tool but unfortunately the execution of how it was taught was poor."	

Fig. 42: EVDS 620/EVDA 782.01 Course Evaluation Survey Answers Instructor 2

4.3 Results EVDP 644 B02 2020

The analysis for the professional planning design studio course focuses on the diagrams completed by students but also outlines the observational data collected. The data analysis revealed the following:

4.3.1 EVDP 644 B02 Diagram Results

Students completed weekly diagrams for this course. At the beginning, these diagrams were completed by hand, but later on, when the course was moved online because of the Covid-19 pandemic, they were completed electronically. Students worked in groups of two or three throughout the semester and completed one diagram per group. Although nine students decided to participate in the research, two opted out of this particular research element, and only three groups could be included in the study, as follows:

Group 1	Group 2	Group 3
2 students (2 females)	3 students (2 males, 1 female)	2 students (1 male and 1 female)

Fig. 43: EVDP 644 B02 Student Diagram Groups

Students were asked to rate (scale 1 to 3) the twelve DSM categories against their progress. The rating was based on the evaluation of “How did we get here” and “Where do we want to go?”. The recorded ranking was visualized as a spider diagram. These diagrams, together with the rankings, acted as a discussion and evaluation point with their instructor.

The Matrix Families
Reflection on Decisionmaking Process
Deductive - CROSSROADS

Group _____
Date _____

TERRITORIALITY rating: (1-3) observations: _____
Mosaic ☐ _____
Lines ☐ _____
Patches ☐ _____

FLOW rating: (1-3) observations: _____
Exchange ☐ _____
Bodies ☐ _____
Ecology ☐ _____

CONTINUIT rating: (1-3) observations: _____
Agency ☐ _____
Technology ☐ _____
Material ☐ _____

EXPRESSION rating: (1-3) observations: _____
Cultural ☐ _____
Social ☐ _____
Practice ☐ _____

Group 00

Comments:
general: _____
top 4 topics: _____
bottom 4 topics: _____

Fig. 44: DSM Category Rating Template

The spider diagrams discussed here were produced by student groups over a period of five weeks, electronically. They reveal that the ratings of the DSM categories changed quite significantly for two groups (Group 1 and Group 2) while the rating for the third group (Group 3) remained stable. Group 3 only changed one of its ratings, the category Bodies. They downgraded it from 2 to 1 in Week 4. It appears that the group was content with their project and their assessment of the situation early on (which is indicated by the comment they made in Week 1: “We are reframing our investigations/proposals/designs into what we discussed in the first week or two of the studio”). However, they adapted some of their category interpretations to reflect their move to working with the community online. Groups 1 and 2 on the other hand changed their ratings frequently, although Group 1 rated the categories Mosaic, Exchange and Cultural as important for their project throughout (while they considered the category Ecology of low relevance throughout). This indicates that while they were sure about their priorities for their project, there were still changes to their work. Group 2, on the other hand, changed all of its ratings constantly and significantly up to the very last week, before the final presentation. The comments they provided indicate that they struggled with their project because of the pandemic lockdown. In Week 3 they wrote: “There are a lot of things to keep track of, feels like a bit of a juggling act trying to keep all elements of the project moving forward”.

Group 1¹²

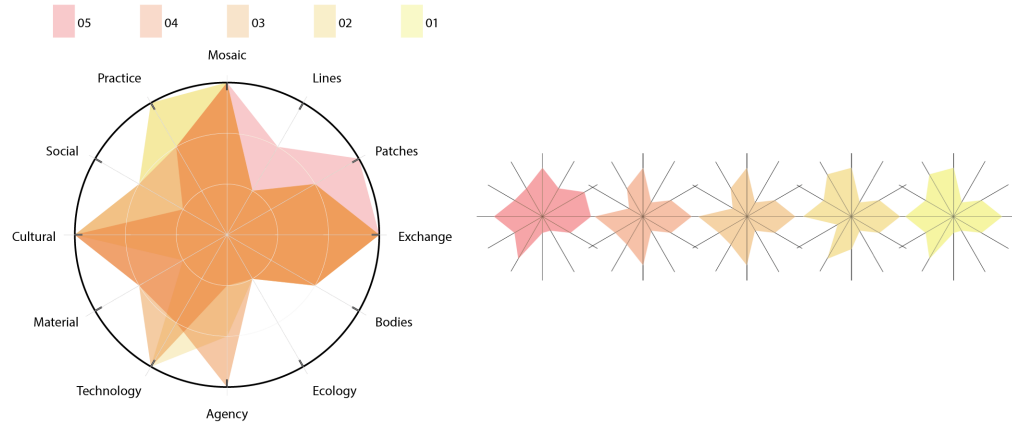


Fig. 45: EVDP 644 B02 Spider Diagrams Group 1

Group 2

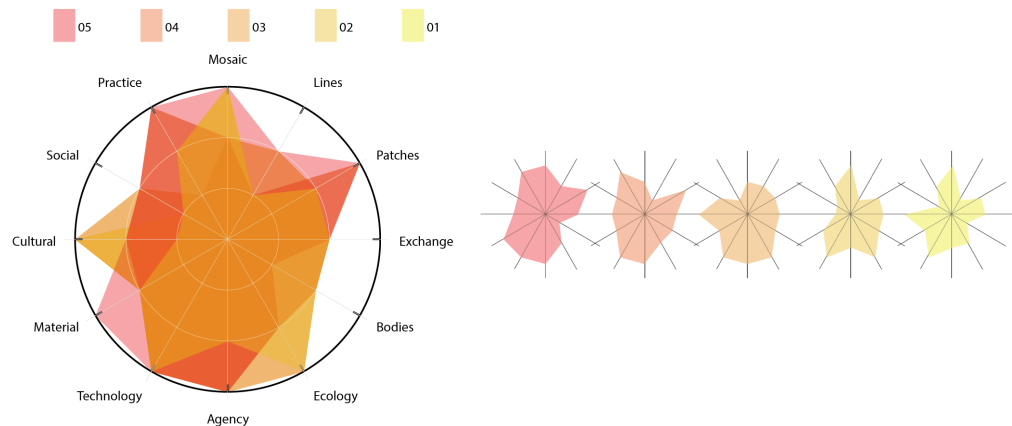


Fig. 46: EVDP 644 B02 Spider Diagrams Group 2

¹² Note: 01-05 indicate instances of recording with the ranking of categories visualized as a spider diagram. The diagram on the left has all five recordings overlapping - a summary of the rankings over the period of five weeks. The five individual diagrams on the right show each recording separately.

Group 3

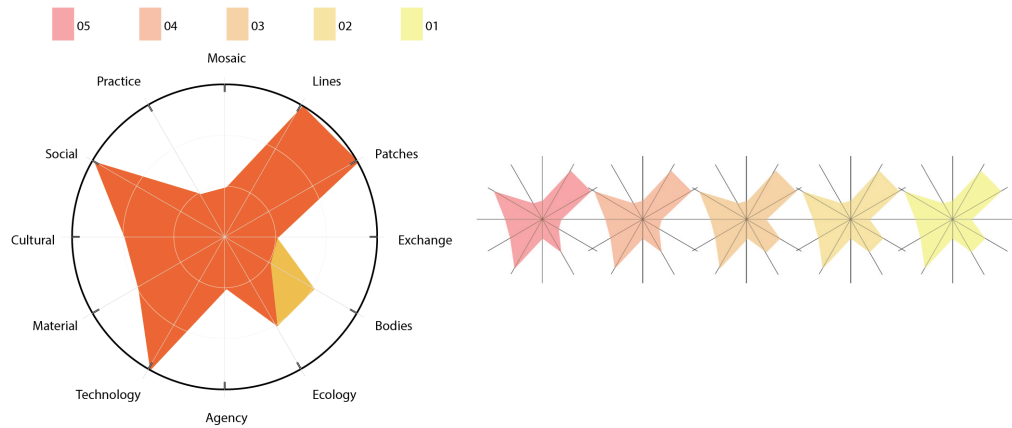


Fig. 47: EVDP 644 B02 Spider Diagrams Group 3

The student group ratings for each category over time show that Group 1 rated the categories in the DSM family Expression the highest. Group 2 gave the categories in the Content family the highest rating and Group 3 rated the categories in the DSM family Territoriality the highest. This means that compared with the outcomes of the questionnaires handed out in the interdisciplinary design studio EVDS 620/EVDA 782.01 2019, there was less of a preference by student groups for one specific DSM family. It appears that students had a desire to cover many, if not all, of the DSM categories over the course of the term. The weekly charting of their 'progress' might have pushed students' desire to achieve full coverage.

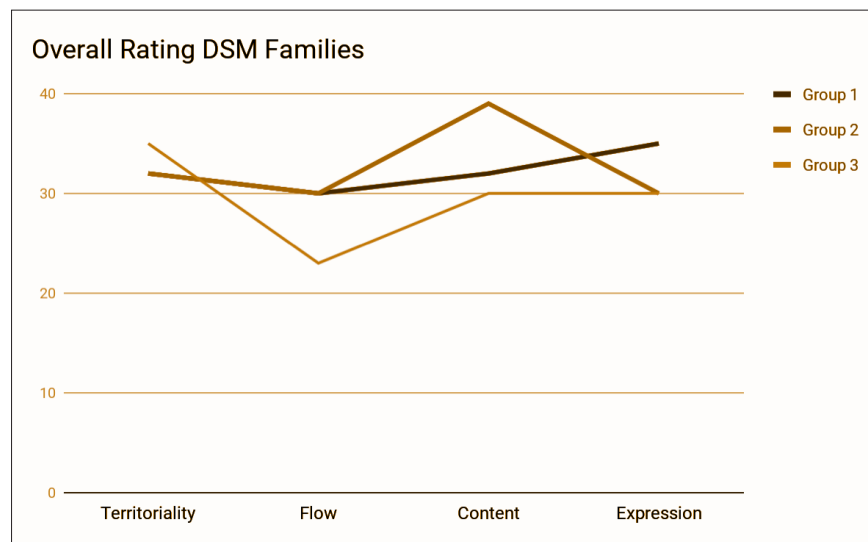


Fig. 48: EVDP 644 B02 Overall Rating DSM Families by Student Groups

When rating the DSM categories in respect to their projects and their progress, students could also leave comments. However, very few comments were made on the rating sheets, although Group 2 always indicated the main themes/issues they were working on that week and how these related to the DSM. For example, in Week 3 they wrote: “This week we worked on the online platforms: Bang the Table and Cargo websites and based our Matrix on our learning and findings”. These comments were however difficult to evaluate, as they are more statements of fact than of opinion.

Comments general:	
top 4 topics:	
Bottom 4 topics:	

Fig. 49: DSM Category Rating Top/Bottom Topics and Comments

4.3.2 EVDP 644 B02 Observation Results

The observations completed in the design studio classroom, before the course moved online, confirmed those made in the interdisciplinary design studio. At the beginning of the semester, students were keen to work with the DSM. However, as the course progressed, students appeared to utilize the DSM less and less, even though they were asked to complete weekly diagrams. There were, however, differences between students/student groups. These were mainly visible in the weekly desk crits, where some of the student groups used the DSM and their ratings of the DSM families to critically reflect on their projects/project proposals, while others saw the discussion of the DSM more as a duty than an opportunity to discuss their work. These mixed attitudes are also visible in the University course evaluation survey (see Section 4.3.3).

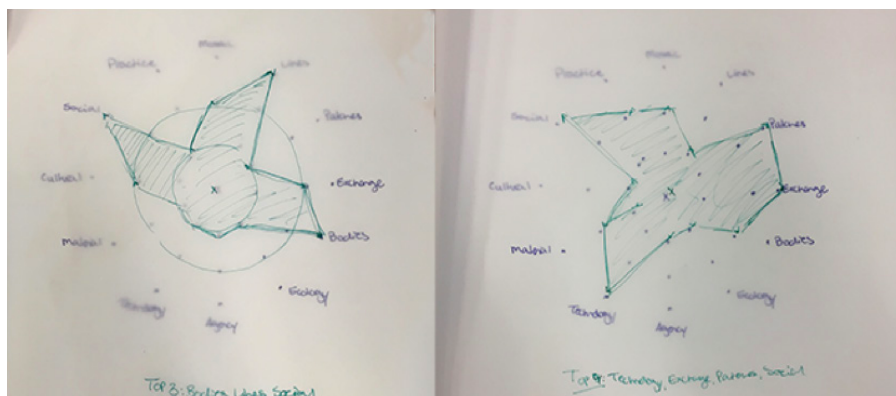


Fig. 50: EVDS 620/EVDA 782.01 Students' Visualizations

4.3.3 EVDP 644 B02 Course Evaluation Survey Results

The responses provided by students in the University course evaluation survey indicate that students felt that, overall, the professional planning design studio course was academic in nature. “It was more theoretical than professional, but that’s not necessarily a criticism”. Students made only a few comments that related directly to the DSM. One student wrote: “The Matrix was fun and a great learning. Something I will take on with me for my future design analysis”. Another student wrote: “I am mixed about the Matrix and its usefulness. Towards the end of the term, it became more a task to complete and less of a team design conversation”. Meanwhile, a third one said: “One could learn more and appreciate it better if the use of this tool was during the first year of the program”. This indicates mixed feelings towards the DSM. There was especially criticism in regard to the required weekly rating of the DSM categories against the process, although there was some indication that this was useful at the beginning of the project. This supports the findings in the interdisciplinary design studio course, where students also indicated that they found the DSM useful in the early stages of the project, for the site analysis. There were also voices that stated that the DSM was limiting, similar to those in the interdisciplinary design studio course evaluation.

General comments	
“It was more theoretical than professional, but that’s not necessarily a criticism.”	
“The actual course content was quite academic in nature and did not fully ground itself in practical applicability.”	
“This course was heavily based in abstract theory and academia.”	
DSM comments	
“The Matrix was fun and a great learning. Something I will take on with me for my future design analysis.”	
“I am mixed about the Matrix and its usefulness. Towards the end of the term, it became more a task to complete and less of a team design conversation.”	
“The use of the Matrix. The use of this design tool is helpful, but as it relates to this particular course it limited me.”	
“Endlessly updating the Matrix even after it stopped being an effective tool.”	
“The weekly work plan should be optional or not included at all. I understand the value in project planning, but up-keeping it and discussing it each week was more time consuming and added little value to our design process, workflow, or even experience in the studio.”	
“One could learn more and appreciate it better if the use of this tool was during the first year of the program.”	

Fig. 51: EVDP 644 B02 Course Evaluation Survey Answers

4.4 Results EVDP 616 2020

The analysis of the data for the planning design studio course, similar to that for EVDP 644 B02, focuses on the diagrams completed by students. However, the interview outcomes are also presented and discussed, as they provide a relevant insight into students’ attitudes and allow for some comparison with the discussions/interviews conducted in EVDS 620/EVDA 782.01. The results for this course are as follows:

4.4.1 EVDP 616 Diagram Results

As this course ran entirely online, all of the diagrams were completed electronically. Students, similar to EVDP 644 B02, worked both individually and in groups throughout the term and, when working together, completed one diagram per group. These diagrams, of which there are eight in total, are discussed here. They were produced by three student groups as follows:

Group 1	Group 2	Group 3
2 students (2 females)	2 students (2 females)	2 students (2 males)

Fig. 52: EVDP 616 Student Groups Diagram

As in the Advanced Professional Planning Studio course EVDP 644 B02, students were asked to rate (scale 1 to 3) the twelve DSM categories against their progress and visualize their rating as a spider diagram.

The spider diagrams reveal that the ratings of the DSM categories changed quite significantly for all of the groups. This is similar to the ratings provided by Group 2 in EVDP 644 B02, which changed up to the very last week, just before the final presentation. While in the case of this group this was due to a struggle with the project provoked by the pandemic lockdown, in this course students' decision to change their ratings frequently appeared to be due to the nature of their design project task as well as their desire to develop a culturally relevant and appropriate proposal. For example, Group 2's ratings indicated their continued efforts to adapt their design to an Indigenous context: "Culture: mirror to identity, humanity and community uniqueness. Culture worth keeping and practicing, it is core to our identity and ethical perspective, and trans-cultural view is core to co-existence".

Group 1¹³

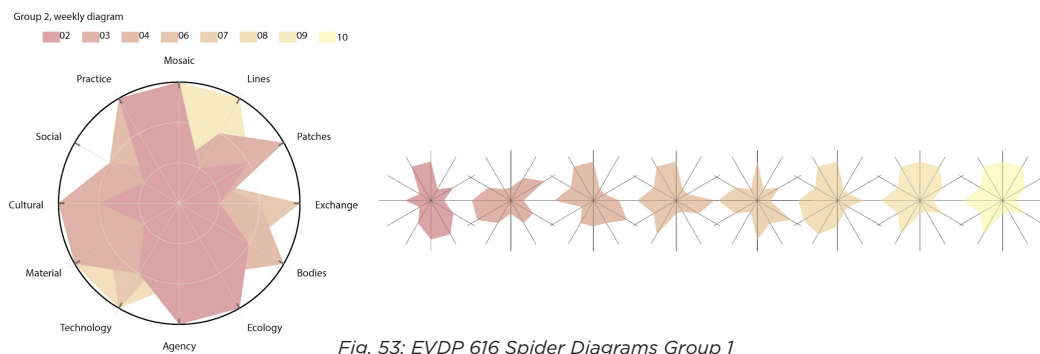


Fig. 53: EVDP 616 Spider Diagrams Group 1

Group 2

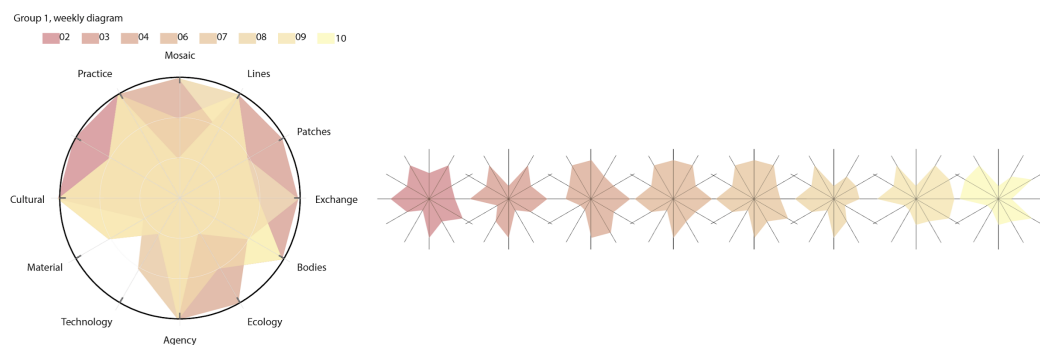


Fig. 54: EVDP 616 Spider Diagrams Group 2

¹³ Note: 02-10 indicate project week and instances of weekly recording with the ranking of categories visualized as a spider diagram. This is a 12-week course. Visualized diagrams here are group work. Excluded weeks were diagrams based on individual reflection. The diagram on the left has all five recordings overlapping - a summary of the rankings over the period of five weeks. The five individual diagrams on the right show each recording separately.

Group 3

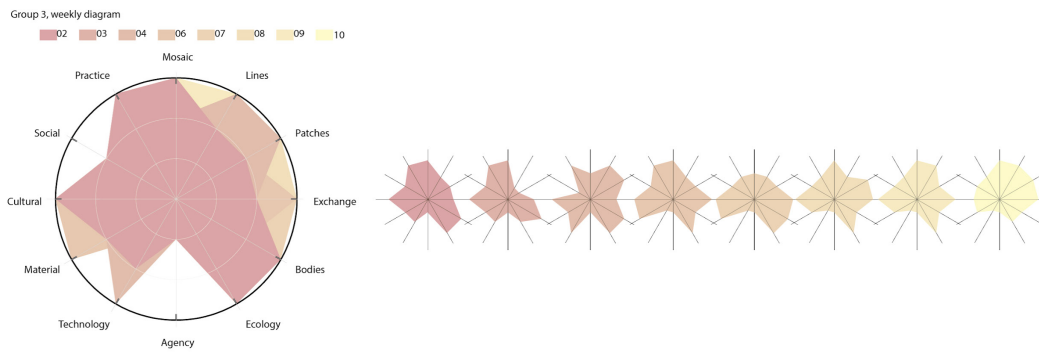


Fig. 55: EVDP 616 Spider Diagrams Group 3

The student groups' ratings for each category over time show that Groups 1 and 2 rated the categories in the DSM family Expression the highest, while Group 3 rated the categories in the DSM Family Flow the highest. This means, as in EVDP 644 B02, there was no absolute preference for one of the DSM families among students when rating their process. This might be due to the fact that neither EVDP 644 B02 nor EVDP 616 made the DSM a compulsory part of the assignments and thus students felt more confident in also exploring the DSM families they were less sure about.

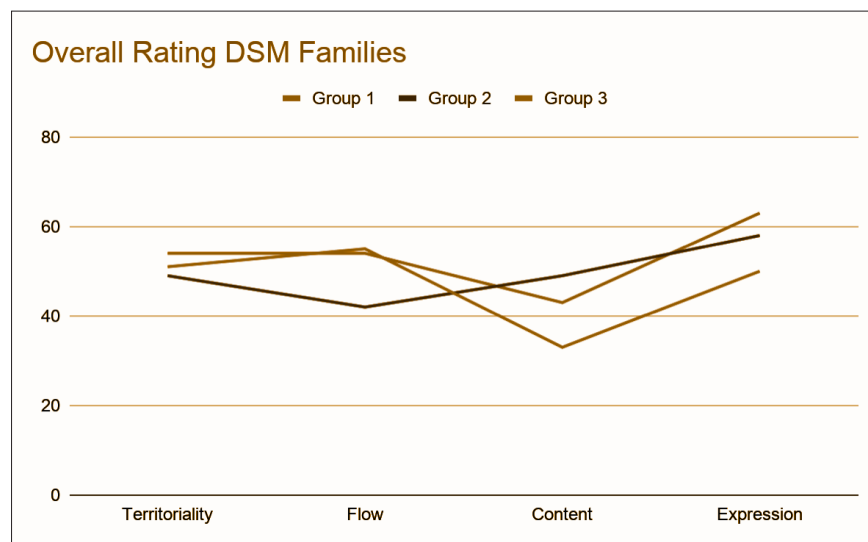


Fig. 56: EVDP 616 Overall Rating DSM Families by Student Groups

What is interesting in this studio is that all three groups added their interpretations of the DSM categories to their diagramming sheet. These interpretations, together with the ratings, changed significantly over time. For example, in Week 2, Group 1 defined the DSM category Exchange as “economic & social communities”. They changed this to “social & economic collide” in Week 3. In Week 5, they replaced their definition with “economic & community opportunities” and then in Week 6 with “exchange through urban function”. It appears that the students tried to create their own DSM glossary for their projects or at least to adapt the existing one to fit their needs.

Group 3 also left additional comments on their rating sheet indicating the main themes/issues they were working on that week and how these related to the DSM, similar to the comments provided by Group 2 in EVDP 644 B02. For example, in Week 2, Group 3 wrote: “The ratings are based on how many MX terms being focused on in the research & analysis in preparation for assignment#2”. As in the professional planning studio course, these comments were difficult to evaluate and thus were taken more as facts than opinions.

4.4.2 EVDP 616 Interview Results

The students interviewed in this studio were more positive about the DSM than those in the interdisciplinary design studio course. They generally found the DSM useful, in particular to help them map their progress and also to see the changes in their projects over time. However, similar to those in the interdisciplinary design studio, they found some of the DSM terminology challenging. Also, they were not sure how useful the weekly mapping was. Students expressed that less frequent mapping would have been sufficient, especially towards the end of the project. As one student said: “It is like a rocket, once you launch into space you do not need that giant booster”. Students were also unsure whether they would use the DSM beyond the studio although some students were more positive than others. Those that said that they would use the DSM in the future indicated that this application would most likely include some adaptations to the original tool: “The heart of it will definitely follow me, in practice, in the future. In one of the other courses, I already used a Matrix, but not with the same terms. I used it as a tool to frame, to see how balanced things are”.

The detailed responses by students were:

Semi-structured Interview/Female 1:

Female 1 found the DSM very helpful to both guide her in the design process and also to reflect on her decision-making. However, she clearly said that the requirement to rate and map the DSM categories weekly was too frequent mainly because it was unlikely that within a week major changes would occur. She suggested that the frequency with which the DSM is revisited should be flexible as at certain stages in the project it makes sense to refer to it less than at other stages. She indicated that a later project stage it could even be useful to sometimes forget about it. Female 1 also suggested that the DSM category rating could be increased from 1-3 to 1-5 to make changes more visible in the diagrams.

	General
"I think the Matrix, at least in terms of the studio process, has been a helpful guide to refer to at various stages because it allows you to see the gaps you are missing."	
"It helps you think holistically rather than into niche details."	
"It is an interesting tool, as objective as you can be, to critique your process and where your project stands."	
	DMS Category Rating
"The rating 1-3 is a little bit challenging. 1-5 is probably the minimum I would go for. 1-10 would probably be more beneficial but 1-5 seems reasonable."	
"We did not necessarily need to do it as often as we did, I would say, because within a week's span your decisions have not necessarily changed so drastically that it was impactful."	
"I find that sometimes, when you take a breather... We had, I think block week, it was a break, and we did the Matrix again, it was almost more valuable. It was like revisiting with new eyes, in a sense."	
"It is like a double sword, if you are using the Matrix too much you are not able to think about it."	
	Terminology
"Every time I did use the Matrix, I felt I had to open the Glossary, because some terms do not automatically resonate with me. There are some that are more obvious, like social and cultural. They are more literal. Whereas there is others that are more ambiguous and could be interpreted differently."	
	Group Work
"The Matrix is almost more beneficial in a group setting than it is individually. The ones we did as a group were a sort of check-in which we did not necessarily realize would be helpful."	
"The Matrix tool is that sort of neutral tool that starts a dialogue."	
"You can see how your personal interests or priorities start to blend together as you work together. They are morphed into the Matrix."	
	Future Usage
"The Matrix is definitely very helpful and I would like to see it implemented in future studios or courses."	
"The heart of it will definitely follow me, in practice, in the future. In one of the other courses, I already used a Matrix, but not with the same terms. I used it as a tool to frame, to see how balanced things are."	

Fig. 57: EVDP 616 Female 1, Selected Interview Answers

Semi-structured Interview/Female 2:

Female 2 particularly liked that the DSM helped her see what had changed in her project over time. However, she found some of the terminology difficult. Also, the meaning of words changed for her over time, which made the weekly category ratings challenging. Because of this, she said that she would probably not use it again in the future but agreed that the DSM has benefits for students. It can help them decide on the focus of their projects.

	General
"I like the idea that you can track your progress and see what was important to you at the beginning of the project and what continued to be important and maybe what changed."	
"The benefit is that it helps you, almost with the first Matrix, what you want to focus on."	
	DMS Category Rating
"The grading is not consistent. It changes based on what I think what the meaning of each word is, each time I read it."	
"Sometimes it has not necessarily been a tool. It has been more, oh, it is time to fill out a Matrix."	
	Terminology
"Some of the terminology is a little bit difficult."	
"The words that are used are not necessarily explicit. Every time I have to fill out the rating... I can't look at words like bodies and understand what it means. I have to go through and read again what it means."	
"Also, every time I read, there is almost a new meaning to me."	
"Simpler language or language that is more obvious about what it is talking about would be helpful."	
	Future Usage
"I think I probably won't go back to it."	
"It is probably good as a student to understand the process, to understand what might have changed, but I don't see myself using it in the future."	

Fig. 58: EVDP 616 Female 2, Selected Interview Answers

Semi-structured Interview/Female 3:

Female 3 also enjoyed using the DSM as it allowed her to see the developments in her project. She found the DSM terminology fairly straightforward to understand, especially the terms she used and referred to frequently in her project. She said that the DSM had been a useful reflection tool. It had also helped her group with goal setting.

	General
	"It's definitely interesting. I've never used a tool like this before."
	"In the big picture it has been interesting to see the change throughout the term and have that visualization."
	"As a reflection tool it is very valuable."
	DMS Category Rating
"I was not totally sure how to approach it. In the beginning it was more like I do the work and then fill out the Matrix. But then I sometimes tried to pre-empty those and have these as sort of my goals for that week. I am not sure if one is better than the other. They are obviously different, it feels different."	
"Also, in the beginning, I was not really looking back or tracking it that way whereas the last few times I filled it out it's been... I start with the sheet that is already filled out from last week. I see how things have evolved and then I move numbers accordingly."	
"Having the rating tight like that is good actually, for me, just because... One the one hand it's tight but on the other it is quite complicated, right, to organize things this way."	
	Terminology
"There was not too much that was a very foreign concept. Everything seemed fairly straightforward."	
"There were definitely some terms that were a constant theme throughout the term and so I was very familiar with them whereas others I did have to look up a couple of times."	
	Group Work
"I have been quite lucky with my group and this has translated in terms of the use of the Matrix as well."	
As a group, we have shifted to complete the Matrix in terms of the work that was coming up."	
	Future Usage
"People in my class have adapted their own Matrix reading."	
"I can see me using the Matrix, for sure, but I am not sure if it is applicable to everything."	

Fig. 59: EVDP 616 Female 3, Selected Interview Answers

Semi-structured Interview/Male 1:

Male 1 said that he found the DSM useful at the beginning of the project and less so later on, echoing what other students had said in this studio and also those in the interdisciplinary design studio. As with other students, he was unsure whether he would use the DSM in the future, although he could see it helping him to define the direction of projects.

	General
"At the beginning it was fairly helpful because I had no idea how to design the place and then the Matrix provided guidelines or directions, what aspects do we have to look at when we design the sites."	
"I found the Matrix a little bit restraining to the design process because there is so many tangible and intangible aspects that cannot be described with the Matrix."	
"As I progressed with my project, I did not pay too much attention to the Matrix."	
"It is like a rocket, once you launch into space you do not need that giant booster."	
	Terminology
"I had a hard time to understand some terms, especially at the beginning."	
"Maybe Mosaic, Patches, Lines are the most confusing ones, when I was trying to understand each term in the Matrix."	
"Cultural practices, social, economics, like those things, they were fairly easy to understand."	
	Group Work
"When I was with my group, and we discussed the Matrix, my group member had a different understanding of the Matrix. This created a massive discussion. This made the group work a little bit difficult."	
"Also, how we see the framework... I see it as a holistic approach. My teammate saw it as some kind of hierarchy. And I was like, what?"	
	Future Usage
"I do not really have a structure on how I approach my arts projects."	
"I usually go with a free flow of design and see how things match up."	
"I feel if I was to be working on other projects it might be useful if I design some kind of community with a specific cultural background, to see what aspects to touch upon."	
"I may use it as a starting point to see in what direction I want to head."	

Fig. 60: EVDP 616 Male 1, Selected Interview Answers

Semi-structured Interview/Female 4:

Female 4 emphasized that the DSM was useful for structuring the information she received in the course and that it helped her define the direction of her project. However, she said that once she had decided on a project theme and started exploring an area in more depth, then the DSM ratings were not really able to capture this. Thus, she would have preferred the DSM to be more flexible, enabling interlinkages between seemingly unrelated concepts such as those of patches and culture, and lines and agency. Female 4 said that she would definitely use the DSM elsewhere. She thought that using the tool required some familiarity with the concepts embedded in the DSM to make it useful.

	General
"It was a great tool for layering your design process. You are entering the design process... Your mind, you are already having so much information and then you have to sort out that information to come to one point that can be developed as an idea or some visualizations. For that purpose, it was a great tool."	
	"It narrows down everything you are thinking."
"Sometimes we are lost. When you go into your project, in depth, you forget everything, the driving principles. You forget about those things. It helps you to remember."	
	DMS Category Rating
"It shows you what you are leaning towards, in general terms. But once you have entered the process and focus on a specific area, it does not show you what happens there. That area would expand to so many more elements than what can be seen."	
	Terminology
"Some of the descriptions, some of the elements of the Matrix, are general."	
	"The terminology to me was clear. I grabbed that at the first glance."
"The mosaic, the lines and the patches, these ideas, beside the physical description, it could also apply to other elements of the Matrix. For example, we could say we have patches of culture, we have lines of agencies, this is the path that agency follows. So, this can be improved in a way that it covers more detail."	
	Future Usage
	"It helps you visioning, long term, short term visions."
"I think I am gonna used it. Maybe not the actual Matrix but the layers that I defined my project through."	
	"I gonna use the outcomes or take outs that I've got from the Matrix."
"I'd say it can be useful for other studios. Maybe not in the first year because people come from so many different backgrounds and it would make it hard for those people to figure out what they are doing as these factors are so design orientated. It requires you to have a background in design and have and have an understanding of all these descriptions."	

Fig. 61: EVDP 616 Female 4, Selected Interview Answers

4.4.3 EVDP 616 Course Evaluation Survey Results

The answers provided in the course evaluation survey showed that students appreciated the course. They valued in particular the direct work with First Nation members. They enjoyed the stories told and breaking away from Western planning concepts. Interestingly, none of the students' responses related to the DSM. It appears that the DSM was more integrated in this course than in the others and thus students did not feel the need to comment on the DSM directly. This may also be due to the fact that they not only talked about/reflected on their DSM ratings in their respective groups but also displayed them on the shared whiteboard where peers could see and comment on them. When asked about the relevance of the course material, they agreed that it "achieved its objectives", and "was well integrated" and "useful throughout the entity course".

	General comments
"This has been the best studio course I have taken so far in this program. The integration of Miro for online learning was extremely helpful. I can see that it was a well thought out and planned studio."	
"I really enjoyed this course with the freedom in assignments, the topics, story time, and the openness of the class. the videos of the site were very helpful for distant education, I wish all studio classes had the site recorded like [name of instructor] had."	
	"Thanks so much for this wonderful experience and opportunity."

Fig. 62: EVDP 616 Course Evaluation Survey Answers

4.5 Further Outcomes

The project team - Dr. Graham Livesey, Dr. Enrica Dall'Ara, Dr. Fabian Neuhaus, Sandra Abegglen and Dr. Mary-Ellen Taylor - have written an article (Design Thinking Diagram: A tool for Decision-Making) that introduces the DSM as a tool that helps facilitate the ongoing decision-making that is part of any design process. In that article, the latest iteration of the DSM is presented, based on the outcomes of this research. The article is due to be published in summer 2021 in the AMPS (Architecture, Media, Politics Society) Conference Proceedings Series and in a Special Issue of the Journal Architecture MPS.

Dr. Fabian Neuhaus has presented the Design Studio Matrix project at the international conference AMPS on Education, Design and Practice – Understanding Skills in a Complex World held in New Jersey 2019 with a focus on design education.

Furthermore, the team of the interdisciplinary design studio course EVDS 620/EVDA 782.01 - Sandra Abegglen, Hal Eagletail, Dr. Graham Livesey, and Dr. Fabian Neuhaus - were awarded the University of Calgary Team Teaching Award 2020 for their work on that course (see Appendix). It was recognized that the team had successfully worked across disciplines and across cultures, and made this work the focus of their course. This shows that the teaching in this course was successful, with the DSM playing an active part in the course design and delivery.

Also, out of this project came a heightened interest in design education at the School of Architecture, Planning and Landscape, with a new research project looking at online teaching and learning, the Teaching and Online Network (TALON). This initiative was started as a direct response to the need for emergency remote instruction for virtually all higher education institutions around the world due to the Covid pandemic. Through an open and evolving dialogue with faculty and students on emerging technologies and practices, TALON creates a hub for exchange, with international research. Within the first year TALON reached 6849 views of its website, which lists 184 resources. TALON has also sent out 18 (news)letters, 63% of which were opened within the first two hours, and collected 27 voices from academics and students, which are available both as videos and podcasts. TALON also successfully runs a social media campaign that helps disseminate its work and connects interested academics.

5. DISCUSSION

Design studio education has a long tradition (Drexler, 1984; Madrazo, 1994; Peters, 1979; Van Zanten, 1975; Wingler, 1975) and is regarded as the signature pedagogy of the design disciplines (Motley, 2017; Peel, 2011; Schrand & Ellason, 2012; Shulman, 2005). While there is agreement that the fostering of design-thinking is critical for students (Razzouk & Shute, 2021), there is still a strong focus on outcomes and thus ‘...the current studio culture rewards students with the best looking projects’ (Koch, Schwennsen, Dutton & Smith, 2006).

The DSM was developed by Dr. Graham Livesey, Dr. Enrica Dall’Ara and Dr. Fabian Neuhaus in summer 2018 to help their students manage the design process and also to shift the focus away from the product towards the process and the reflection thereof. The aim of the Design Studio Matrix: Supporting the Decision-Making Process as Part of a Reflective Practice research project was to investigate whether the DSM:

- Leads to more successful student learning and ultimately greater student satisfaction;
- Supports the shift from product to process, putting design studio learning center stage; and
- Allows students and faculty to discuss their experience based on a shared method.

The data collected in three Masters design studio courses - EVDS 620 Urban Design Studio/EVDA 782.01 Senior Architecture Design Studio 2019; EVDP 644 B02 Advanced Professional Planning Studio 2020; and EVDP 616 Planning 2020 - between Autumn 2019 and Winter 2020 revealed the following:

The analysis of the questionnaires handed out in the EVDS 620 Urban Design Studio/EVDA 782.01 Senior Architecture Design Studio course in fall 2019 showed that students understood the DSM Flows family best and stuck to that family throughout the design process. At the same time, students said that the Content family was least relevant for their work. It appears that they struggled with some of the DSM terminology (for example, they mentioned the categories Mosaic, Agency and Social as difficult to grasp). Students found the DSM useful for the analysis of the project site. However, they were less sure about the usefulness of the DSM for mapping or diagramming their ideas. While students were open to using the DSM in a different context or project at the beginning of the course, they rejected this later on. This finding was confirmed in the focus group discussions and semi-structured interviews. Students found the DSM useful in the early stages of their project and less so later on, although some students were more critical of the tool than others. In the discussions and interviews, students also commented on the form and structure of the DSM, seeing it more as a list of related concepts and terms rather than a circular diagram with segments that overlap and intersect. Being part of a cross-cultural course and working on a cross-cultural topic also made them question the DSM terminology, and they clearly attributed it to a Western perspective. When asked about future usage of the DSM, most of the students interviewed, similar to those who completed the questionnaires, were unsure. The observations conducted in the interdisciplinary design studio confirmed these findings. At the beginning of term, when introduced to the DSM, students engaged and worked with the tool intensively. This enthusiasm disappeared as the course progressed, although students still had to map their project against the DSM families. The observations also revealed that mapping personal ideas and design solutions against a given set of concepts/terms is not only challenging for students, but also difficult for them to relate back to their own learning.

The analysis of the data collected in the EVDP 644 B02 Advanced Professional Planning Studio course in winter 2020 supported the findings from the interdisciplinary design studio, although the students on this course appeared slightly more positive. The ratings of the DSM categories and the resulting spider diagrams showed that only one group had a clear preference for particular DSM families/categories whereas the other two groups changed their ratings throughout the time of recording. It is difficult to say why there is such a difference, but it can be speculated that the differing implementation and required tasks in relation to the DSM made a difference. In the interdisciplinary design studio course, the DSM formed part of some of the assignments and thus students might have been less willing to experiment. They stuck with what they felt they knew. In contrast, in the professional planning course, the DSM was purely used for checking in with students and reflection on their progress. From the comments made by students on their ratings, it can be assumed that there is a bidirectional influence between the ranking of the DSM categories and the students' projects; either one can impact the other. This means that the groups based the ranking on the themes they discovered while working on the project, but then also developed the project in the areas they ranked higher in the DSM spider diagram. The students on this course, like those in EVDS 620/ EVDA 782.01, were keen to use the DSM at the beginning of the course but appeared to utilize it less as the course progressed, even though they were asked to complete weekly diagrams. As expressed in the Course Evaluation survey, they found the weekly ratings of the DSM categories against the process useful at the beginning, but less so later on.

Students in EVDP 616 were the most positive when asked about the DSM. They generally found the DSM useful, in particular to help them map their progress and also to see the changes in their projects over time. However, similar to those in the interdisciplinary design studio, they found some of the DSM terminology challenging. Also, like the students on the other courses, they were not sure how useful the weekly mapping was, especially towards the end of their projects. The spider diagrams revealed that the ratings of the DSM categories changed quite significantly for all of the groups throughout the time of recording. Students had no clear preference for one of the DSM families/categories. What is interesting in this studio is that all three groups added their interpretations of the DSM categories to their diagramming sheet. These interpretations, together with the ratings, changed significantly over time. It appears that the students adapted the DSM terms to their own perceptions/needs.

Transferring these findings to the design process itself, one could speculate as to how different strategies unfold in different contexts. In the case of a single DSM family focus (as in the interdisciplinary design studio) it could mean that a single theme, which is already dominant at the beginning of the process, is being carried through to the final product, especially when there is pressure to achieve particular outcomes (in this case, high grading of work). On the other hand, when reminded of the spectrum of aspects (as in the professional planning studio and the planning studio) through weekly mapping and reflection, the project focus continues to shift and becomes broader - and in some cases even an attempt to cover all facets or as many facets as possible.

While the DSM may help facilitate reflection on the design process and thus shift the focus away from the final product towards learning, it is questionable whether this also leads to greater student satisfaction (as hoped by instructors when developing the tool and implementing it in different design studio courses). However, tools like the DSM certainly allow students and instructors to discuss their experiences based on shared methods. Thus, the DSM can be regarded as a "booster pack", as expressed by one of the student

participants, that enables students to successfully take off with their design projects. It can also help them to consider different aspects of both the design brief and the design process and thus help reduce complexity and confusion in the initial phase of projects.

5.1 Recommendations

To sum up, the DSM appears to be a useful tool for capturing students' interest and focus as it ties in with their design work. Visualizing this information allows for discussions between students and instructors of their work based on a shared framework, the DSM. The DSM also helps shift the focus of student learning and teaching as it does not put the product, the end design, center stage. However, it is questionable how far the DSM leads to more successful student learning and student outcomes. As Tanner (2012), in reference to Garner (1988), states, what is needed for successful learning is to "learn how to learn". While the DSM provides guidance in the decision-making process and provides pointers for reflection, it does not include a direct evaluation of one's own learning processes. This is something that needs to be actively facilitated and supported by instructors. Thereby, as McAllister (2010, p. 82) suggests, "treating the design process as a product" may help.

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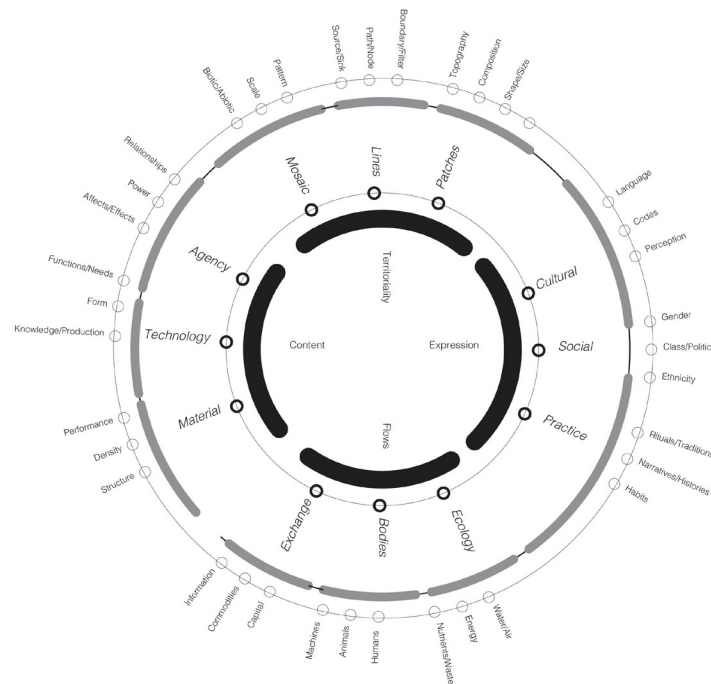
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7. APPENDICES

DESIGN STUDIO MATRIX - VERSION AUGUST 2019



Design is a complicated subject where everything matters. Humans are fundamentally designers; humans create artefacts, shelters, communities, and landscapes. Design involves conceiving, representing, and executing constructions across a wide range of scales. Traditional, or pre-modern cultures tend to develop well-established design practices that evolve slowly over time and reflect cultural and often religious practices. Modern culture, since the Renaissance, has emphasized individual human creativity, resulting in the cult of celebrated ‘designers’. Postmodern culture uses a wide variety of traditional, modern and contemporary techniques.

Design can be subjective and/or objective, artistic and/or scientific, structured and/or unstructured, borrowed and/or original, material and/or immaterial. Ultimately design is creative and technical and satisfies the needs and aspirations of culture in that it creates culture. Increasingly, designers are faced with the challenges of a rapidly changing world. Design draws from what some scholars have called practice knowledge (Cross, N., 2006. *Designers Ways of Knowing*. London: Springer London). The designer makes this his/her own process, taking control of it based on an individual judgment that makes sense in the broader narrative. As the designer, you take ownership of and responsibility for a process that evolves through a string of decisions.

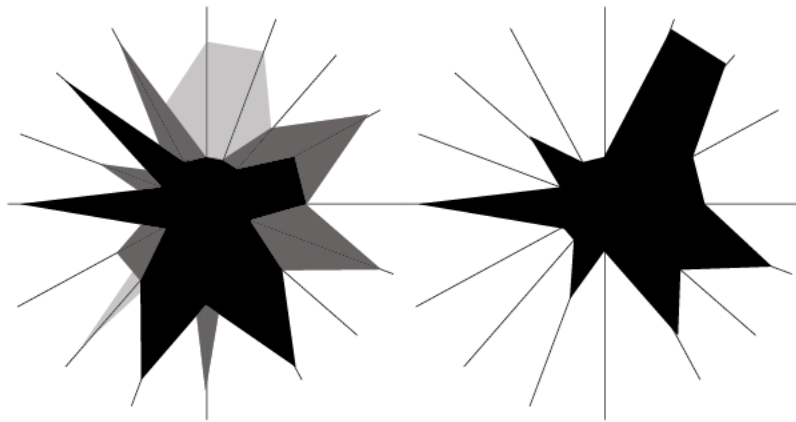
To help structure this ongoing decision-making process, we are introducing the Matrix (MX) as a working tool. It is intended to guide the design process by establishing a framework for the context of the design

work. The Matrix is, in part, based on Gilles Deleuze and Félix Guattari's concept of 'assemblage'. Deleuze and Guattari identify that there is a horizontal axis and a vertical axis associated with assemblages. The vertical axis deals with territorial aspects, those forces that unmake and make territories. This includes internal and external forces. The horizontal axis deals with 'bodies, actions and passions' bringing together content and expression.

Assemblages, as conceived of by Deleuze and Guattari, are complex constellations of objects, bodies, expressions, languages, qualities, and territories that come together for varying periods to create new ways of functioning. The diagram is the code or arrangement by which an assemblage operates. It is a map of the function of an assemblage. An assemblage as a functional entity is innovative and productive. The result of a productive assemblage is a new means of expression, a new territorial/spatial organization, a new institution, a new behavior, or a new realization.

The Vertical Axis of the Matrix defines Territoriality (Patches, Lines, and Mosaic) and Flows (Ecological, Bodies, and Exchange). The Horizontal Axis defines Content (Material, Technology, and Agency) and Expression (Cultural, Social, and Practices). The categories address spatial structure and place, temporality and motion, material culture and process, representation and cultural practices. As a framework, these represent a possible version to capture and structure the multitude and complex nature of the built environment. Each of the four families has three subsections, and hence a total of twelve key terms are defined in the adjoining Glossary.

A design can be situated in this framework through a relation to both the terms and the real-world reference. A reflection on the design's position, the framework supports the calibration of the design proposed. Iterating this calibration as a back-and-forth process visualizes the decision-making process.



TERRITORIALITY

Patches

Shape/Size; Composition; Topography

A patch is part of something marked out from the rest by a particular characteristic. It is different in some way from the area that surrounds it (Cambridge Dictionary, <https://dictionary.cambridge.org/dictionary/english/patch>). The term implies the existence of a broader system to which the patch belongs as a distinguishable part. A characteristic urban tissue of a neighborhood, distinctive architectural features (type, materials) of a cluster of buildings, a grove within meadows, and a peculiar topography, may be examples of elements that define patches. Borrowing concepts from landscape ecology, the shape and orientation of patches, as well as their spatial composition, are essential in determining their interaction with the surroundings (Dramstad et Al., 1996, pp. 19-25, 31-32).

Key-concept/Example: Land Use, Urban Tissue, Architectural Types, Vegetation Patches, Accentuated Landform.

Lines

Boundary/Filter; Path/Node; Source/Sink

In geometry, a line is defined as a line of points that extends infinitely in two directions. It has one single dimension, length. Nevertheless, the concept of a line expands to involve other meanings and functions, acquiring - both physically and symbolically - more complex dimensions: edges or boundaries (Lynch, 1960; Bell, 1999, p. 33-34; Dramstad et Al., 1996; Corajoud, 2000), limits or frontiers (Zanini, 2002), barriers or filters (Dramstad et Al., 1996, p. 35), diaphragms, and paths (Lynch, 1960). In such meanings, lines might include nodes (Lynch, 1960), gates and different degrees of porosity. Lines may also function as corridors (Dramstad et Al., 1996, pp. 35-40; Bell, 1999, p. 34). "Width and connectivity are the primary controls on the five major functions of corridors, i.e. habitat, conduit, filter, source, and sink" (Dramstad et Al., 1996, p. 36). Conceived as corridors, lines imply flows (See the following chapter "Flows").

Lines are relevant in perceptions of perspective (Bell, 1999, p. 19), and therefore their investigation may involve visual aspects. Topology, which is the study of lines that correspond to linear continua or curves, involves identifying different line shapes in the plane or three dimensionally (Bell, 1999, p. 19), and contributes to interpreting site morphology, including the spatial properties that are invariant under any continuous deformation.

Key-concept/Example: Networks, Rhizomes, Boundaries, Edges, Hydrography (streams and rivers), Roads and Roadsides, Railways, Pathways, Powerlines, etc.

Mosaic

Pattern, Scale, Biotic/Abiotic

The term Mosaic refers to something intrinsically comprehensive of multiple elements that are interrelated to each other. In art, a mosaic refers to a surface composition of small tesserae that creates geometrical patterns or figures by means of different colors and/or materials. In landscape architecture and landscape ecology, the term is used to define the overall, complex structure of a landscape, determined by both natural and anthropogenic factors. Indeed, a landscape is not characterized by its single elements but by the functional and visual relationships among its components. The focus is “more on the relationships among objects than on the objects themselves” (Marot, 1999). “The overall structural and functional integrity of a landscape can be understood and evaluated in terms of both pattern and scale” (Dramstad et Al., 1996). Biotic and abiotic components of the environment, through their interactions, define patterns. “Patterns are everywhere, and it is by recognizing them that we orient ourselves, try to make sense of the world and predict the way that certain actions might occur. [...] Patterns are evident at a very wide range of scale from the molecular structure of DNA, at the microscopical level, to the spirals of galaxies in the universe” (Bell, 1999, p. 1).

Key-concept/Example: Geometrical Composition; Figure-ground Organization; Biotic and Abiotic components; Functional Interactions.

FLOWS

The concept of flow is related to movement, and therefore refers to time (duration, frequency, cycles, etc.). Flows are time-space phenomena.

The environment is in a constant state of flux. The changing seasons bring new colours and life to the spaces and the hustling and bustling of the everyday moves the goods. The city follows its routine. Masses of people migrate over the course of the day through the city, rush hour after rush hour. Large volumes of products move into the city for consumption or out into national systems for trade together with finances, energy and waste. These various mechanical, natural, artificial, social or natural flows make up the exchanges of the urban fabric. As a collective, they are responsible for a large part of the characteristic of a particular place. They are in sync with the uses but make up a distinct, mostly invisible or at least temporal portion of the urban fabric.

The flows are generated through activity by and between the different usages. Examples of flows can be Transport, Ecology, Energy, Economy, Knowledge, Waste, Technology, and so on. Most of these are temporary. They fluctuate or disappear entirely during certain hours, days or months, e.g. pedestrian flows or rainwater. Others are not tangible but instead manifest mainly through infrastructure, e.g. power lines or finances.

Ecological

Water/Air, Energy, Nutrients/Waste

Natural resources (water, air, etc.) and energy flows are dynamically dependent on and affect the landscape mosaic (Bell, 1999). Multiple life cycles interact with the environment. This involves both natural and anthropogenic processes. Water and air are essential environmental components, which affect ecosystems and communities. “Within the hierarchical structure, there is a degree of vertical integration with feedback between levels and connections and between individual landscape mosaics and their constituent elements, by means of energy flows (direct in the case of heat or indirect in animal or human activities). These flows are dependent on and, in turn, affect the patterns of the mosaics; thus they change over time and at different rates” (Bell, 1999, p. 33).

Key-concept/Example: Water Cycle, Production, Consumption and Waste Cycle, Renewable Energy

Bodies

Humans, Animals, Machines

As bodies, we mean humans, other animals and machines that move within and across the space through spontaneous or defined tracks. The bodies’ movement is generated from needs, functions and interactions with the environment and other bodies. Everything in the social and natural world exists in constantly shifting networks and relationships (Latour, 2005). With regard to human movement, Hägerstrand (1970) identified three categories of limitations or constraints: capability, coupling, and authority. The location and duration of stops, to engage with places and other bodies, are key aspects of movement patterns. These patterns are affected by conditions and functions of the environment. At the same time, bodies’ movement may creatively shape places and make them dynamic and changing (Halprin, 1969) during the day and across seasons.

Key-concept/Example: Circulation, Transportation, Telecommunications, Wildlife Corridors, Migration Flows.

Exchange

Capital/Barter, Commodities/Gifts, Information

Exchange is commonly the act of giving something to someone and then giving you something else in return (Cambridge Dictionary, online). It is the basis of both economies and information. Exchange is intertwined with the production, distribution and consumption of goods and services. Human settlements, and cities as the maximum expression, are the place of exchange of capital and commodities (Marx, 1887). Barter has characterized the economy of various cultures, and it is worth mentioning, especially with regard to new emerging forms of solidarity within local communities in response to the widespread economic crisis.

Information is another fundamental form of exchange. We can refer to how and where people share information, to informatic systems embedded in city shaping, and to ways in which inhabitants and visitors are informed within the city (about urban functions, services, amenities, local identities, etc.). Access

to information implies knowledge and the ability to make decisions, and contributes substantially to democracy and equality.

Key-concept/Example: Economic Aspects, Community Markets, Community Hubs, Internet.

CONTENT

Material

Structure, Density, Performance

Material is a physical substance that things can be made from (Cambridge Dictionary, online). A material possesses a specific structure, density and possibilities of performance. Material systems have a double life, actual (depending on their properties) and virtual (depending on their capacities). Both actual properties and virtual capacities are real characteristics of an object. “To explain the creative behavior of any material system we normally need both a description of a mechanism that explains how the system was produced, and a description of the structure of its possibility space that accounts for its preferred stable states, as well as its transitions from quantitative to qualitative change” (Deleuze, 1994, cited in DeLanda, 2015). DeLanda (2015) highlights that matter possesses morphogenetic powers, projecting fascinating implications for architectural design and urban design.

Key-concept/Example: Architectural Material, Plant Material, Artifacts, Fabrication.

Technology

Knowledge/Production, Form, Functions/Needs

We can frame technology as the practical, especially industrial, use of scientific discoveries (Cambridge Dictionary, online). Lewis Mumford (1952) stated that, “we ordinarily use the word technology to describe both the field of practical arts and the systematic study of their operations and products”. He preferred to use the term technics, to describe “the part human activity wherein, by an energetic organization of the process of work, man controls and directs the forces of nature for his own purposes”.

Key-concept/Example: Production Systems, Technical Facilities, Engineering Principles, Advanced Technologies.

Agency

Affects/Effects, Power, Relationships

Action, power, and operation are terms related to agency (Collins Dictionary, online). In common language, agency is a business, or other organization, providing a specific service (Collins Dictionary, online), the capacity, condition, or state of acting or of exerting power (Merriam-Webster dictionary, online). In sociology, an agent is an individual who engages with the social environment. Michel Foucault reflected on the relationship between power and knowledge and how they are used as a form of social control

through societal institutions. Stehr and Adolf (2018) highlighted that “the close connection of knowledge, power and government is by no means confined to governmental agencies or the large institutions”. Citing Michael Foucault (2007), they recall that in any society there are “multiple forms and loci of governing”. Understanding the variety of forms and loci of governing is crucial in planning activities. The planning process itself is based on agencies. How planners and designers in their decision-making use information, that is a source of power (Forester, 1988), matters. How they may engage with and act on behalf of the community in their planning is still worth questioning and investigating. The burning criticism by Christopher Alexander (1966) of the excessive simplification of urban planning fosters the exploration of new ways of conceiving and organizing the city based on a semi-lattice structure.

Key-concept/Example: Business, Organizations, Associations.

EXPRESSION

Cultural

Language, Representation, Codes

Culture is a complex concept in the Humanities and Social Sciences, which may be defined in different ways. For many years, the debate focused on a juxtaposition of high culture (classic works of art and philosophy) and mass culture (or popular culture). In a more recent, anthropological definition, “the word culture is used to whatever is distinctive about the ‘way of life’ of a people, community, nation or social group”.

“Culture is about feelings, attachments and emotions as well as concepts and ideas”. “Culture is about ‘shared meanings’”. It is “not so much a set of things [...] as a process, a set of practices”. “Meanings can only be shared through our common access to language”. Language “operates as a representational system”. Representation is “one of the central practices which produce culture” (Hall, 1997, pp. 1-11). Sharing and communicating meanings between members of the same culture implies and generates cultural codes.

Key-concept/Example: Art(s), Signs and Symbols (e.g., sounds, written words, images), Sense of Belonging, Sense of Place, Identity, Regulations.

Social

Gender, Class, Ethnicity

With the term social we want to embrace aspects such as Gender, Class and Ethnicity, in the perspective of fostering equality through planning and design processes. Gender refers to “the behavioral, cultural or psychological traits typically associated with one sex” (Merriam-Webster dictionary, online). Most cultures use a gender binary - male and female, boys and girls, men and women - although recently discussions about different (more diverse) gender identities have emerged in the public realm. Feminists have for a long time argued that “There is no either/or. Rather, there are shades of differences” (Fausto-Sterling, 2000, p. 3) and hence people are gendered rather than sexed. In this context Judith Butler (1988) argues that gender is not an expression of what one is but rather something that one does. She has therefore

'collapsed' the sex/gender distinction in order to argue that there is no sex that is not always already gender. This means that there is no 'natural body' that pre-exists its cultural inscription. This leads to questions regarding 'How to design and build without bias?' as well as the inclusion of different genders in the professional design world to create gender equality. Social class is the hierarchical arrangement of individuals in society, usually defined by wealth and occupation: "A group sharing the same economic or social status" (Merriam-Webster dictionary, online). The most common categories used to describe social class are: upper, middle and lower class. However, there is no clear consensus on what these categories are (for example, other categories have been suggested - viz. <https://www.bbc.com/news/magazine-22000973>) and what makes people belong to a particular category. Karl Marx thought that class was defined by one's relationship to the means of production (the proletariat, those who work but do not own means of production and the bourgeoisie, those who live off the surplus generated by the proletariat's operation of the means of production). Max Weber, however, argued that class emerged from an interplay between class, status and power. Regardless of the definition used, it can be argued that a person's socio-economic class has wide-ranging effects including the area they live in or can move to, or the influence they have in their community.

Ethnicity is defined as "Individuals who consider themselves, or are considered by others, to share common characteristics that differentiate them from the other collectivities in a society from which they developed their distinctive cultural behaviour..." (Scott and Marshall, 2009).

Practices

Rituals/Traditions, Narratives/Histories, Habits

De Certeau (1988) focused on everyday practices as "ways of operating" or doing things. Practice may be defined as something that is usually or regularly done, often as a habit, tradition, or custom (Cambridge Dictionary, online).

Conceived as "a set of fixed actions and sometimes words performed regularly, especially as part of a ceremony" (Cambridge Dictionary, online), rituals are a special form of practice. Practices relate to myths (Barthes, 1957). "In premodern societies, myths were narratives that were conventionally sung, danced, acted out or recited in the form of poetry. Their function was to encapsulate and express the collective consciousness of a particular social group through explaining cultural origins, regulating group relationships or reinforcing a moral system. Barthes used the term "myth" in his analysis of consumer culture and its artifacts in order to reveal that even in the sophisticated technological society [...] objects were organized into meaningful relationships via narratives that expressed collective cultural values" (Huppertz, 2011, p. 88). Narratives shape people's lives (Abbott, 2008). Practices derive from and produce history. According to Pierre Bourdieu (1992, p. 54), "the habitus, a product of history, produces individual and collective practices - more history [...]".

How urban spaces are organized and intertwined in space and time, their rhythm (Lefebvre, 2013), plays a key role in influencing people's practices.

Key-concept/Example: Religious Celebrations, Symbolic Places, Historic/Traditional Trails, Community Gathering-points, Story, Storytelling, Meaning-making, Identity, Oral History.

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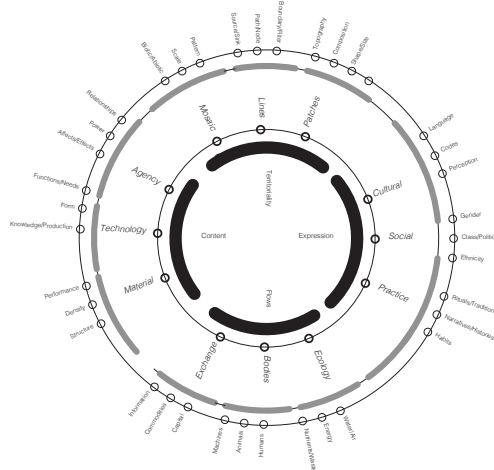
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MATRIX ITERATIONS

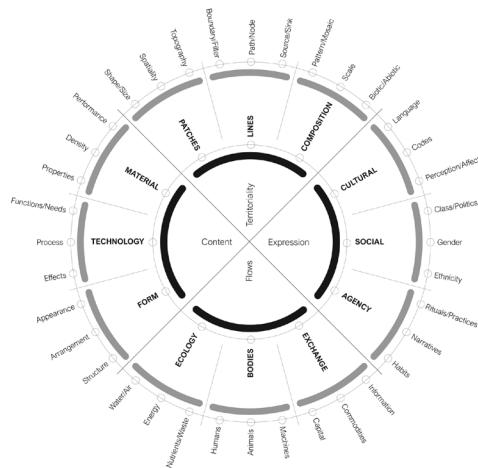
2018



2019



2020



DESIGN STUDIO MATRIX:

SUPPORTING THE DECISION-MAKING PROCESS AS PART OF A REFLECTIVE PRACTICE

School of Architecture, Planning and Landscape
University of Calgary, Alberta, Canada

April, 2021