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Space-Shaping Through Rhythmic Interventions for Teaching and Learning: Pedagogical Perspectives

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Abstract

We explore the challenges and opportunities relevant to rhythmanalytical approaches in teaching and learning through two socio-spatial and design-oriented courses with graduate and undergraduate students. Through the courses we investigate how different understandings and analyses of *rhythms-through-space* in comparison to *rhythms-in-space* generate different patterns of interventions. We also share prospects for preparing and structuring future teaching and learning that integrate time-sensitivity through constructively aligned activities supporting the development of different forms of knowledge. This work supports recent calls for greater attention to how temporality and particularly rhythms could be better understood, observed, framed, and conveyed. In the foreground is the need to improve how we guide students' research through design-oriented learning experiences. For this we provide frameworks bringing together concepts from rhythmanalysis and constructive alignment. We draw on comparative and case study experiences from 2022 and the winter of 2023/2024 involving interdisciplinary bachelor-level and master-level courses, respectively. Our cases wrangle with the relationships between socio-spatial and temporal scales that steer or constrain rhythmic patterns expressed in students' analyses and design interventions. From an instructional standpoint, this contribution poses the question: Which conceptual structures in design-oriented pedagogy could support rhythmanalytical approaches and capacities for future spatial planners and designers? Our final reflections discuss opportunities for improvement and evaluate how future planning pedagogy research and work could build on our experiences.

Keywords

constructive alignment; course design; pedagogy; rhythmanalysis; spatial planning and design

1. Introduction

Time-sensitive and specifically rhythmic approaches to exploring and analysing space are increasingly of interest in urban planning and design (Marušić & Marušić, 2024). In parallel, time-sensitivity is increasingly pronounced in practice and policymaking, too. We see evidence of this vis à vis discourses relating to the 15-minute city, which leverages a temporal motto to idealise proximity-based accessibility (Mouratidis, 2024). We also see this rise in rhythm-based approaches that some link with territorial intensities and activities (Drevon et al., 2024), or concerns with possibly reckless focus on efficiency through increased pace in planning (Dobson & Parker, 2024). Even in the context of well-being and sustainability-minded efforts, governments are being lobbied for time policies honouring the right to time or improved collective organisation of time (Time Use Initiative, 2024). These recent and practical initiatives follow historical engagement with policies for managing rhythms of daily life, such as local "time offices" from the 1990s highlighted by Drevon et al. in their Gwiazdinski-inspired work (2024, p. 23). A last frontier at which work has yet to grapple with time-sensitive and particularly rhythmic foci is within the educational realm. Our contribution takes up this concern to improve treatments of rhythms through teaching and learning by responding to the question: Which conceptual structures in design-oriented pedagogy could support rhythmanalytical approaches and capacities for future spatial planners and designers? The following sections set a context for, introduce, summarise, discuss, and reflect on the integration of rhythmanalysis in teaching and learning through design studio courses contributing to spatial planning education and research.

In delving into current pedagogical work involving design-oriented projects for spatial planning, little language on time-sensitive or rhythmic concerns exists. This is no wonder, as current debates integrating rhythmic approaches into design formats and practices are still developing. These currently work on (a) advancing time-sensitive concepts as dimensions worthy of equal consideration alongside spatial or place-based concepts (Marušić & Marušić, 2024) and (b) the need to innovate disciplines methodologically (Wunderlich, 2024). Yet, despite growth in attention to design-oriented thinking in spatial planning and its pedagogy, an explicit and finer-grained consideration of rhythm is still absent. We address this blindspot by beginning with a discussion on design-oriented planning scholarship and pedagogy to contextualise possibilities for rhythmanalysis. Turning to the work by Cozzolino et al. (2020) that aims to clarify growth and interest in design-oriented studies, we can follow a five-fold increase of urban design studies and the focus on *change over time* and *future-orientation* for design-oriented practice and scholarship. This confirms observations from others (Roberts & Nelson, 2024) but expresses minimal time-sensitivity (i.e., rhythm, tempo, lifecycle, etc.) despite the growth in attention over the last two decades. This deficit in time-sensitive thinking is likely attributed to how planning and design approaches commonly privilege spatial concepts (Chang, 2023a; Wunderlich, 2014).

Perceiving this lack of development, Wunderlich's (2024) emphatic rejoinder argues for the sensibility of evolving our thinking and practice by integrating time-sensitive dimensions into how we analyse, design, and deliver urban spaces through a new and rhythmically centred form of temporal urban design. In a similar fashion, we believe opportunities for time-sensitive and rhythmic foci could be created through planning pedagogy. This could enhance the slow move away from relying on pre-determined or purely physical planning aims to outfit future practitioners with additional creative competencies in the face of the growing complexity observed by Frank and Da Rosa Pires (2021), amongst others (Lukovich, 2017). This re-orientation could also seek out and evaluate the critical but creative de-layering and re-layering exercises

for students that some already experience by integrating rhythmanalysis into design-oriented approaches and methods (Radović, 2004). But first, we introduce rhythmanalysis before examining how pedagogy research in spatial planning and design has yet to accept or integrate time-sensitive thinking.

2. The Rhythmanalytical Point of Departure

When Lefebvre, along with his wife Catherine Régulier, developed rhythmanalysis in their publication *Le projet rythmanalytique* or *The Rhythmanalytical Project*, prevailing and time-sensitive concerns of their epoch put forward by Bergson concentrated on measures of duration or *durée*; rhythmanalysis, in contrast, illuminated the lived and incalculable experiences of time inspired by the flows and pluralities of rhythms in everyday life (Lefebvre & Régulier, 1985; see also Lefebvre, 1992/2013). The legacy philosophy and analytical theory acknowledges and accentuates *rhythms* that unfold through the temporal qualities of unintentional as well as coordinating and programming practices or relationships in space (Chang, 2023a). We are also encouraged by Lefebvre and others to draw on corporal senses and observations to learn the rhythms of the body before developing the capacity to "listen to the world" without disrupting rhythms or dislocating them in time (Lefebvre, 1992/2013, p. 29). Rhythmanalysis thus motivates us to engagements with time and its repeating patterns that may be constrained by or succumb to capitalist production of space (Lefebvre, 1992/2013). Lefebvre and Régulier possibly built their thinking upon the work of Lúcio Alberto Pinheiro dos Santos and Gaston Bachelard (Lyon, 2018). Different from other work, their thinking is gaining appeal from readers who are curious about alternative and rhythmic ways of framing time that are manifold and associated with but not the same as movement (Lefebvre & Régulier, 1985; Lefebvre, 1992/2013). To this end, rhythm is both qualitative and quantitative. It is a concept and analytical tool for settings where place, time, and energy interact (Lefebvre, 1992/2013). By appreciating rhythm as a vital concept in how space is experienced and conceived, rhythmanalysis enables us to articulate the many co-existing and simultaneous rhythms (polyrhythm) that may be further delineated into rhythmic patterns of combination (eurythmia), attuned unison (isorhythmia), or even discordance (arrhythmia; Lefebvre, 1992/2013; Lyon, 2022). The value of this is not only felt in spatial and urban planning; the evidence of this was clearly heightened during the Covid-19 pandemic after public health and social distancing policies drastically changed behaviours in public and private spaces (Lyon, 2022). Beyond this, we see proof of expanding appreciation via the take up of rhythmanalysis in fields such as urban sociology, urban studies, and geography, as well as specific fields such as mobility studies and urban design (Chang, 2023b; Edensor, 2010; Lyon, 2022; Wunderlich, 2024), or even as a methodological field of its own (Chen, 2016).

With regards to spatial planning and design pedagogy, no comparable precedent exists up to date. A limited number of studies explore classroom settings through rhythmanalysis in education research. These studies analyse physical teaching and learning spaces as potential sites for improvement. For example, Andersson and Risberg (2019) consider how physical education learning environments could provide better integrative spatial and temporal experiences by exploring the rhythmic and in-path interactions between teachers and students. Similarly, Davies (2023) uses rhythmanalysis to demonstrate the lack of intercultural capability characterised by the fluid, symbolic, and rejected spaces conceived and communicated by geography students during the simple act of switching classrooms. Unlike these examples that leverage rhythmanalysis *in* spaces of teaching and learning addressing social subjects of study, our approach reformulates rhythmanalysis *for* teaching and learning about socio-spatial concerns in planning and design pedagogy. The intent is to inform methodology through the development of new educational frameworks that

influence future spatial planners' and designers' work. It also supports design-informed ways of understanding temporal and spatial concerns (Wunderlich, 2024), while enhancing urban policies and programmes serving communities with social science supported methods (Nevejan & Sefkatli, 2020). In the next section, we build upon rhythmanalysis to introduce spatially relevant concepts that will be linked to the pedagogical framework of constructive alignment. The latter refers to the outcomes-based and pedagogical approach developed by Biggs et al. (2022) that strives to enable students to perform final learning objectives by ensuring that programme or unit teaching/learning activities and final assessment tasks are aligned to the activities stated in the intended learning outcomes. This pedagogical framework is a standard of pedagogical practice in fields including planning and design (Ma & Rizzo, 2024; Moosavi & Bush, 2024; Qu et al., 2020); it will be detailed in Section 2.2.

2.1. Rhythms and Space: Finding Patterns of Flows and Fixity

A key characteristic of rhythm is that it expresses continuous fluctuation through repetition marking socio-spatial regularities that we may discover, observe, and analyse (Lefebvre, 1992/2013). Recall the concepts of polyrhythmia, eurhythmia (and isorhythmia), as well as arrhythmia introduced by the work of Lefebvre and Régulier. A socio-spatial re-framing of this could differentiate between (a) *rhythms-through-space*—flows of repetitive patterns with trajectories from one place to another—and (b) *rhythms-in-space*—repetitive patterns that stick to sites over a timeframe. The first pattern draws on Hägerstrandian time geographic considerations of movement constraints (see Ellegård, 2018). This rhythmic pattern helps us to contrast between polyrhythmic and neighbouring states or forces that induce eurhythmia or arrhythmia. This type of rhythm along "space-time paths" reflects how socio-spatial accessibility might be limited, directed, or coupled with other rhythms (Drevon et al., 2024, p. 22). An example of this could be the momentum (eurhythmia) or disruptive jams (arrhythmia) carried by commuter flows at specific hours of working days. The second pattern focuses on the polyrhythmic entanglements that may find ways to layer and work together (eurhythmia) or in some cases be at odds with each other (arrhythmia). Exemplifying this could be tolerated but temporary uses that synchronise individual rhythmic behaviours into collective routines for undefined periods of time or co-locate in shared spaces (Chang & Gerrits, 2022). Repeating patterns can be analytically studied by following the behaviours and activities contained or coaxed by spatial affordances; these patterns constantly change, unlike the fixed nature of relevant spatial or physical forms or amenities (cf. Marušić & Marušić, 2024). Moreover, these rhythmic patterns are many and diverse; they reflect a vast spectrum of human and non-human actors that interact in, or with space (Sefkatli, 2022). Equally diverse are the perspectives required to make sense of, relate and order, or monitor the rhythmic patterns. To this end, multi- or interdisciplinarity is invaluable in contexts involving the study of rhythms (Wang et al., 2020; Wunderlich, 2024). Finally, and comparable to spatial scales, rhythm fluctuations occur and embed themselves at a range of temporal scales (Abram, 2014). However, the pursuit of relating rhythm to design-oriented endeavours is not without its challenges. The barriers we encounter are deeply rooted in the disciplinary materials and logic that are inherited, reproduced, and ultimately shaped by space- and place-dependent experiences and traditions (Carmona, 2014, p. 12; see also Wunderlich, 2014). If we review the suite of instruments and representations of change over time through maps, plans, or diagrams, it becomes clear how formalistic and traditional means of space-shaping analytics and aesthetics are chiefly static and not effective in communicating dynamic patterns.

2.2. Building Capacity for Time-Sensitivity Through Functioning Knowledge

A pedagogical project supporting rhythmanalysis must first enable teaching and learning to discover new time-sensitive concepts and frameworks both in and outside of the classroom. But a general capacity for this must be built up as even current research and practice experiences show a need for "methodological innovation" to better support rhythmically attuned forms of analyses and design (Wunderlich, 2014, p. 65). In pedagogical terms, educators' and students' knowledge about time-sensitive concepts and how these may be applied must develop simultaneously. For this, it is helpful to recognise how rhythmanalysis entails both *declarative* knowledge embodied in time-sensitive concepts and *functioning* knowledge enacted in the use or interpretation of these concepts in the real world through empirical and analytical tasks. In the context of constructive alignment, declarative knowledge is "knowledge about things" and is defined by content knowledge whereas functioning knowledge "informs action" or is applied knowledge (Biggs et al., 2022, p. 78). This differentiation is pivotal when learning about and engaging with concepts such as rhythmanalysis in a novel manner because it is best supported through an inquiry-based approach to learning, which is often brought to bear with both forms of knowledge developing simultaneously (Biggs et al., 2022). Unlike pedagogical formats such as lectures or seminars that are effective ways for transmitting declarative knowledge, this approach thrives in design-oriented pedagogical environments supporting functioning knowledge or formats that are conducive to process- rather than product-oriented experiences (Pojani et al., 2023). And, because teaching and learning rhythmanalysis cannot rely on established pedagogical conventions (which may be insular and insufficient), different perspectives and methods may need to be introduced or explored. This then emphasizes the need for "learning environment(s) for interdisciplinary negotiation and cross-pollination" that, according to Moosavi and Bush, encourage constructivist learning and innovative pedagogy (2024, p. 577).

As already hinted, these requirements complement constructively aligned pedagogy since "constructively aligned teaching is not a closed loop," rather it allows for "extended abstract" as well as "open-ended" outcomes and does not emphasize what is pre-determined (Biggs et al., 2022, p. 96). This openness invites external or interdisciplinary perspectives to construct new knowledge together. What is essential to this teaching and learning approach is the intrinsic alignment of (a) what is to be learned (intended learning outcomes), (b) how this is to be learned (teaching and learning activities), and (c) the standard of the learning (assessment tasks). Verb-oriented formulation of intended learning outcomes, teaching and learning activities, and assessment tasks underpin this alignment and imply constructivist frameworks of learning (Biggs et al., 2022). Here again, there is compatibility with teaching and learning that seeks to embrace time-sensitive concepts by building up both declarative and functioning knowledge through socio-spatial analysis and design. In recent efforts to update the pedagogical approach and its concepts, Biggs et al. (2022) also explain that the development of functioning knowledge alongside or beyond declarative knowledge is most relevant for the education and capacity building of those who eventually work in professional contexts; this includes spatial planners and designers or architects. Through the next sections we will demonstrate and break down our experiences of integrating rhythmanalysis and constructive alignment into teaching and learning processes.

3. Pedagogical Framework and Methodology

This contribution draws on two comparative and pedagogical case studies to inform and reflect on the conceptual structures needed to incorporate rhythmanalysis into teaching and learning. Both case studies challenged students to improve their understanding of how rhythms might characterise socio-spatial qualities as well as the potential and generative effects of these rhythms through analyses and design. The first pedagogical case study follows the experiences of a project course titled "Changing Rhythms During the Pandemic in Amsterdam Zuidoost" instructed by the second co-author, while the second case study covers the experiences from a design project titled "Shaping Eu(regional) Meuse-Rhine Rhythms— Towards Tri-Regional Harmony, Integration, and Regeneration" instructed by the first co-author. In both courses, students developed empirically supported analyses and designs regarding socio-spatial rhythms. While the first case study featured rhythmic experiences following urban social life during the pandemic, the second case study included a broader range of rhythms linking socio-spatial experiences at the urban and regional levels. Both courses' formats encouraged what Ma and Rizzo (2024) highlight as iterations of exchanges that should take place throughout a course as "timely and frequent provision of knowledge-enhancing feedback is essential for both students and educators to monitor progress and understanding" (p. 6). The case studies shared teaching and learning that structured initial theoretical and substantive topics (block 1) before considering, preparing, and conducting methodological work (block 2). The details regarding participants, disciplines, structure, and constructive alignment of the courses are presented in Table 1.

Table 1. Comparative breakdown of courses integrating substantive (rhythmanalysis) and pedagogical (constructive alignment) concepts.

	Changing Rhythms During the Pandemic in Amsterdam Zuidoost	Shaping Eu(regional) Meuse-Rhine Rhythms—Towards Tri-Regional Harmony, Integration, and Regeneration
Level of study	Advanced undergraduate: third-year urban sociology students (10 participants)	Graduate: third-year urban planning, architecture, and Transforming City Region students (3 participants)
Duration	February–July 2022 (5 months)	October 2023–February 2024 (5 months)
Intended learning outcomes	Identify, document, and analyse rhythms in space and time Articulate urban life with rhythmanalysis concepts during the Covid-19 pandemic from a spatio-temporal lens	Document, compare, and conceive rhythms in space Interpret how rhythmic patterns of harmony, integration, and regeneration could be mapped and represented through a spatio-temporal design concept
Teaching/learning activities	21 sessions Regular readings Weekly supervision meetings Collaborative mapping rhythms in Amsterdam Zuidoost Presentations to the local municipality and feedback session	15 sessions Regular readings Short presentations Regular group meetings, critiques, and coaching Mid-term and final design reviews Individually formative reflections through surveys Sharing of GIS layers used for analysing the cross-border Euregio region

Table 1. (Cont.) Comparative breakdown of courses integrating substantive (rhythmanalysis) and pedagogical (constructive alignment) concepts.

	Changing Rhythms During the Pandemic in Amsterdam Zuidoost	Shaping Eu(regional) Meuse-Rhine Rhythms—Towards Tri-Regional Harmony, Integration, and Regeneration
Digital support tools	Material pooling via Canvas, Google Docs, and Google Maps	Material pooling via Moodle and Miro Mapping with QGIS
Assessment tasks/deliverables	Active participation in all group meetings Individual mid-term assessments of progress (i.e., "Go/No-Go meetings") Mid-term and final presentations Final written thesis (6,000–10,000 words)	Active participation in site visits Active participation in group and peer feedback Teaching and learning survey during weeks 7 and 11 of the course Final poster designs Oral presentations

3.1. Teaching and Learning Activities

Students were provided basic readings and presentations about rhythmanalysis as foundational sources of declarative knowledge. They were also provided methodological support (i.e., materials and orientation for qualitative data collection methods). A key motivation for this was to help build references for a functioning knowledge base to which students could refer for individual work as they iteratively tried new ways to apply their knowledge about rhythms. This was helpful for students as they developed their capacities for identifying, relating, ordering, interpreting, and visually representing the rhythms that they found. With regards to illustrative representations, both spatial and aspatial dimensions were visualised. Since rhythms may seem extremely abstract, finding ways to communicate how they appeared or changed was crucial for both the process of applying the declarative knowledge and influencing or inspiring how they could articulate and design their results.

3.1.1. Visually Representing Rhythms and Space

An effective technique often used in design-oriented courses, including the courses profiled here, is mapping observed uses and activities at multiple points within timeframes; this helps locate behaviours in space and relate them to temporal qualities of duration, frequency, or intensity of phenomena (Marušić & Marušić, 2024; Wunderlich, 2014, 2024). The results from the teaching and learning activities in the form of graphics and maps were the subject of regular discussions on how different spatial features and societal conventions temporally structure rhythms. All projects drew on preceding learning activities that generated data from interviews, participant observations, and qualitative or GIS-informed mapping. For instance, natural features such as topographies or rivers embody unique and tempering elements for speeds of movement or cycles of flow volumes depending on seasonal changes in climate. This was validated by spatial data and interview statements. The final analyses and representations engendering *rhythms-through-space* might show how seasonal constraints limit the periods of activities or express distinct *rhythms-in-space*, such as pauses or changes to recreational activities as illustrated in Figure 1. The same applies to socio-spatial localities such as churches, shopping and cultural centres, or community centres with their own conventions, such as Sunday services, mealtime-based gatherings or general operation schedules and activities as visualised in Figure 2.

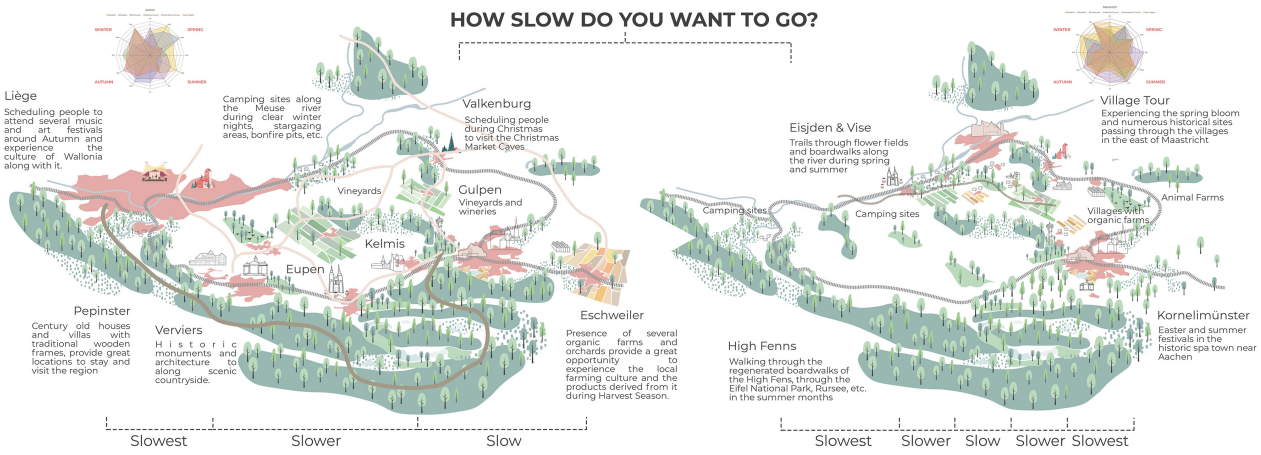

Figure 1. Spatial design-oriented intervention proposing alternative and slow tourism pathways within the Euregio region. Graphics created by Shristi Thakuria during their master studies at RWTH Aachen University (2024).

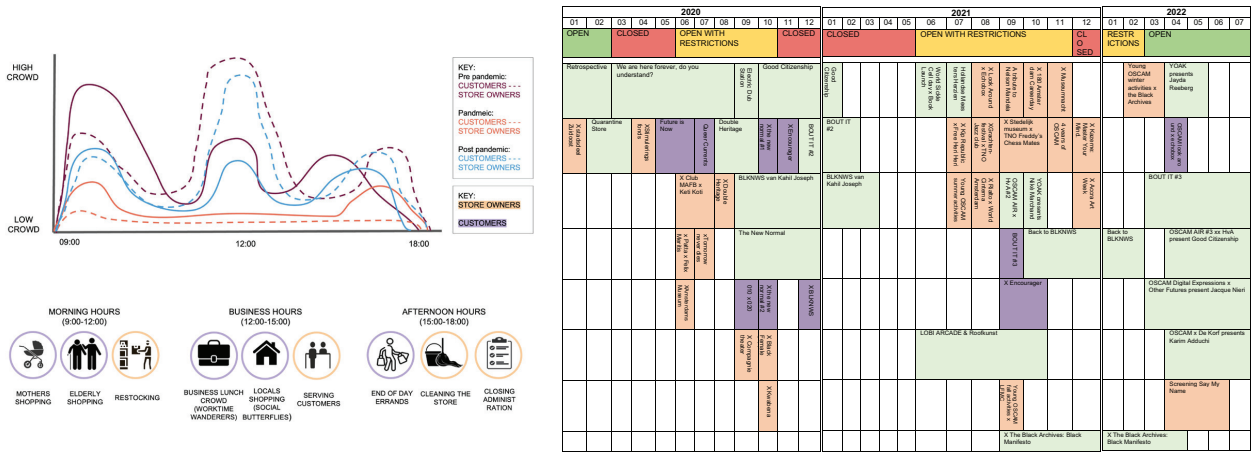

Figure 2. Graphic visualisations of daily rhythms of the Shopperhal shopping centre (on the left) and yearly rhythms of the local contemporary art centre (on the right); created by Anke Krogh and Claire van den Broek (in order) during the 3rd year of their bachelor studies at the University of Amsterdam (2022).

3.1.2. Resource Sharing

Both courses encouraged students to share interim and final content, along with resources, such as literature or GIS layers through online learning management systems (e.g., Canvas and Moodle) as well as applications (e.g., Google products and Miro). Sharing time together, as demonstrated in Figure 3, through iterative discussions during weekly meetings was crucial to helping students in both cases to discover or learn additional methodological insights from their peers. This helped students work through their independent processes of formulating their unique research questions. Moreover, students accessed a broader range of knowledge sources including design and scientific research projects, the instructors' work, or experiments peers conducted on their own. This also improved students' sense of confidence in their abilities to capture and represent rhythms.

Figure 3. Students from case study 2 listen to and discuss a presentation from second co-author in preparation for their own work exploring rhythms in the Euregio context.

3.1.3. Fieldwork

To identify and document rhythms, students in both case studies used ethnographic methods in the field such as site and participant observations along with interviews. The students from case study 1 were introduced to different neighbourhood contexts and community centres in the city borough of Amsterdam Zuidoost. Similarly, students in case study 2 were also presented with the urban centres of Aachen (DE), Maastricht (NL), and Liège (BE) as recommended foci for fieldwork. With regards to local experts, the second co-author facilitated a few points of contact, while the first co-author provided recommendations but did not facilitate contacts for students. Some participants of the first case study also volunteered with the initiatives involved in their subject of study to research topic activities.

The projects that developed a *rhythms-in-space* approach focused on specific and stationary urban places, diving into their rhythmic structures, how they changed during a period (i.e., the pandemic or a calendar year), and the implications of such changes in the participants of these spaces and the areas where they are located. These projects mainly made use of ethnographic methods, where they conducted participatory observations and strengthened their data through informal conversations or semi-structured interviews. The projects that developed a *rhythms-through-space* approach focused on tracing diverse human and non-human subjects of study moving between multiple locations. Similarly, these projects made use of ethnographic methods including participatory observations but supplemented their empirical work with other sources of data such as precipitation statistics or GIS map overlays.

3.2. Assessment Tasks

The means for evaluating the quality of students' learning relied primarily on final and conventional deliverables in the form of theses or posters as dictated by their course and module regulations or manuals. Comparable to the experiences of Ma and Rizzo (2024), however, other formative means of assessment

were included. These focused on active participation in facilitated discussions along with critique and coaching sessions.

4. Analysis and Results

In both case studies, students shared that they missed the tools or terminology for time-sensitive concepts such as rhythms in conventional curriculums. As instructors, we also found few references for orientation and thus incrementally adapted teaching content and activities, while coming to value the advantages of iterative and interactive exchanges as ways to support the integration of rhythmanalysis into the courses.

4.1. Rhythmanalytical Forms of Knowledge

Reflecting on experiences of designing and delivering courses that integrate time-sensitive concepts, a key result related to thinking beyond declarative knowledge during the early phases of teaching and learning activities. Both courses included initial phases with teaching and learning activities as well as materials that helped students deepen their familiarity with how rhythms are structured through conventions such as clocks and calendars that mark or measure time at different scales. The effectiveness of how students began to think critically about the complexities of how or which rhythms locate in space surfaced through the discussions in groups or with the instructors. Declarative knowledge in relation to daily, weekly, monthly, seasonal, and annual time scales or frames were easy starting points for students to identify, classify, and relate rhythms.

Through the fieldwork, students confronted knowledge in action but also realised their own learning activities either required changes or were constrained by the parameters of the course. By thinking through and communicating these limitations, students demonstrated functioning knowledge in the form of new methods or experiments to consider or employ as a part of their own learning activities. For example, some course participants who researched university and high school students mentioned that the rhythm perspective enabled them to empathise with the paused and disrupted experiences of their informants throughout the pandemic. Their take-up of this knowledge would have been limited, had their learning activities been tied to readings and lectures. On the other hand, relying mainly on interviews made the research trajectory more challenging since it required them to build a large sample kit. In contrast, one student following rhythms of river changes through space proclaimed a greater appreciation of fluvial changes but lamented that the four-month semester and course duration did not enable them to follow the natural features over an adequate length of time. Here the students learned first-hand about rhythms in natural spaces but also the shortcomings of broader structures delineating teaching and learning activities. They then adapted their own data collection to include statistical data for precipitation to patch their knowledge gap.

Similarly, one student who followed the elderly at a community centre began with participant observation, which then generated spontaneous and informal encounters. These evolved into unplanned informants and unstructured interviews. Here again the student learned that access to rhythms was not limited to passive methods, but that active methods of collecting information could snowball from initial fieldwork and introduce multiple sources of knowledge. This realisation required more effort but eventually generated more satisfaction for the student. Likewise, students also learned that sources such as GIS layers are limited in how they can enable the visual representation of time. Students who did not intend to step out of

classroom confines quickly learned that they could not rely on the established but static spatial resources to identify rhythms in space. Not only did these sources show a partial snapshot of socio-spatial activities but they demanded students reconcile themselves with fieldwork or ethnographic activities at seasonally uncomfortable or inconvenient times of the year: It would be too cold outside or there would be no informants as it was too cold outside. Developing functioning knowledge through fieldwork was not an option for all students, but instead the only means for accessing the deeper knowledge they required for rhythmanalysis. Various dimensions of knowledge relating to rhythms were taken up through an array of learning activities. These are listed in Table 2.

Table 2. Rhythmanalytical breakdown of knowledge and learning activities.

	Rhythms-in-space	Rhythms-through-space
Course focus and context	Individual and community activity patterns at sites in Amsterdam	Human and environmental activity patterns within the Euregio Meuse-Rhine region
Points of entry How or where did students first identify rhythms?	High school Student accommodations Community centre Food bank Local church Sports club Local art museum or cultural centres Shopping centre	Markets Food producers, suppliers, and retailers Tourists Precipitation, climate, or ecological elements
Rhythmanalytical frames How did students temporally bracket or delimit the rhythms they analysed?	Parts of: Phases of the day (morning, afternoon, evening) Daily rhythms Weekly rhythms (differences between weekdays and weekends) Monthly/seasonal rhythms Annual rhythms Comparing across different time frames: Weekly vs. annual Daily vs. weekly Weekly vs. seasonal Monthly/seasonal vs. annual	
Socio-spatial activities and rhythmic patterns Which patterns of behaviour or action characterise the rhythms?	Suspension (e.g., weekends, holidays) Disruption or decreased rhythms (e.g., social routines during the pandemic) Peak and troughs (e.g., busy periods during lunch hour traffic versus quieter hours) New times and spaces	Seasonal cycles (e.g., fluvial runs and retreats, rivers, agricultural and recreational offerings, holiday periods) Social and collective schedules (e.g., markets, commuting, holiday periods) Distance and proximity (e.g., movements between settlements)

Table 2. (Cont.) Rhythmanalytical breakdown of knowledge and learning activities.

	Rhythms-in-space	Rhythms-through-space
Analytical insights How did spatial elements relate to the rhythms students identified and analysed?	Spatial amenities and activities can convene (i.e., mealtimes) or constrain/construct (i.e., working hours, care work) eurhythmic patterns Places can present unexpected functionalities during the disruption of other rhythms and create new arrhythmic patterns	Natural and moving elements, such as rivers, can be leveraged to attract and create agile but eurhythmic patterns through space Digital events and platforms offer alternative spaces for activities with their own rhythms
Key learning activities What did the students do to identify and analyse the rhythms?	Explore places through observations at different time frames Collect data on a specific place through desktop research Gather qualitative data through interviews or informal conversations Visually and graphically represent spatial and temporal rhythms (e.g., 24 hour-cycle charts for daily rhythms, linear charts for weekly and yearly rhythms)	Collect data via desktop research (i.e., precipitation data sets, website scrapping) Observe sites and their participants over specific timeframes and at various intervals Cartographically analyse and represent rhythms with overlays using the application QGIS Gather qualitative and anecdotal data through interviews and informal conversations Draw, design, and layout cartographic and graphical representations of spatial and temporal rhythms (e.g., paths over space and seasonal changes, river ebbs/flows/cross-sections, seasonal calendars)

4.2. Learning Versus Teaching Activities

Due to the novelty of time-sensitive concepts, both learning and teaching activities have much potential for development. An important takeaway from the experiences shared here is the relevance of interdisciplinarity through diverse methods that students will require to develop the functioning knowledge for conducting rhythmanalysis. Even in early phases of both courses, discussions across different disciplinary experiences presented possibilities for more time-sensitive ways of thinking. Over the course of the learning, peer-to-peer and instructor-to-peer exchanges broadened to include other informants outside of the classroom once students realised that they could not solely rely on conventional sources, references, or methods. For teaching, this means that the instructor's role is invaluable in structuring the process of learning. In other words, we recommend formative approaches to organising how course content is introduced with regular and interactive meetings to generate feedback that help students frame and direct their own inquiry and interpretations about rhythms.

Since rhythms in space are not often obvious, the collaborative and collective processes of finding and sharing rhythms are crucial to enabling students and instructors to build up their own foundation of declarative knowledge. In parallel, these exchanges in the classroom or through fieldwork expose students to new ideas or experiments in analysing and representing rhythms. Small exercises provided by instructors

but conducted together with all students are also helpful. For instance, a simple brainstorm of sensing slow versus fast cities could illuminate how rhythms in space contribute to patterns of temporal intensity. Alternatively, highlighting how temporal scales and structures (e.g., day/week/month/season/year or calendars/schedules) relate to specific sites helps filter out which activities temporally position in which spaces. Another suggestion would be a half-day rhythmanalysis crash course following the introduction to theories relevant to rhythms. This could include individual or group exercises around the university campus during which students and instructors observe rhythms over a short period, then regroup to share and discuss the qualities they see that might help them analyse the rhythms. This in-class warm-up could also reduce students' hesitation to conduct their own rhythmanalysis in the field.

A future initiative to reduce the challenges for instructors interested in pursuing pedagogy that integrates time-sensitive concepts is a repository of exemplary exercises that could help students engage more meaningfully in relating space and time. These could help students develop capacities to identify, classify, relate, analyse, or even evaluate and design rhythms. Such a resource also supports pedagogy that is committed to re-thinking planning and design in terms of both time and space. More broadly and immediately, teaching activities should help students become familiar with the diversity of rhythms in space and become comfortable in making sense of these as socio-spatial patterns. Teaching activities and roles, then, are less about preparing and delivering content as experts and more about staking out or facilitating the process of inquiry. This resonates with the iterative process of pedagogy advanced through constructive alignment as well as the process-oriented and constructivist experiences highlighted by others (Biggs et al., 2022; Moosavi & Bush, 2024; Pojani et al., 2023).

4.3. Coverage, Constraints, and Future Perspectives

A challenge that both instructors and students may confront will concern coverage or the extent of topics to cover in relation to rhythmanalysis. Biggs et al. (2022) discuss the tension between coverage and depth in designing teaching and learning as a matter of expertise and judgment. As there are few to almost no other preceding references on integrating rhythmanalysis into pedagogy, instructors (like students), will likely have to rely heavily on the experiences of their first course as a baseline endeavour. Reflecting on the experiences here, we recommend delimiting the spatial scope and perspectives by beginning with *rhythms-in-space* as these will not overwhelm the teaching and learning activities. A building or site-scale context will be the most comfortable context. It could be worthwhile to delegate sites or encourage students to pick research locations as early as possible to avoid expending unnecessary time and energy dwelling on the uncertainties of how to initiate rhythmanalysis. Even with a city borough-scale spatial context, the students in case study 1 found Amsterdam Zuidoost too broad of a location for their individual projects. Another means of mitigating the students' bewilderment with the new time-sensitive approaches to pedagogy is to focus the learning activities on socio-spatial activities at specific temporal scales. This tack portions spatial and temporal coverage and may require more preparatory and declarative knowledge about social practices, routines, or processes. Most likely, a hybrid of the two approaches to starting the learning activities will be the result.

It also bodes well to prepare introductory materials on methods for fieldwork and visualisation. Mobilising colleagues with experience in specific methods that support rhythmanalysis, optionally, can be helpful, too. Those trained in ethnographic methods or with extensive knowledge and readiness to conduct fieldwork will be better equipped to orient students in their own data gathering and analysis. Additionally, visualisation

techniques including cartographic skills (i.e., with or without GIS) and informed by data that account for time will also help reduce frustration. For example, references to the data visualisation and mapping work of others including Tufte (2006) who spotlight masters such as Minard were well received. We would not recommend focusing only on a singular method as this would hinder students from becoming familiar with the complexity of how socio-spatial rhythms could be understood. A framework for analysing data could also be helpful in case students become dubious or distrustful of their rhythmanalysis process because they end up collecting what they think is too much qualitative data through field notes, ephemera, and interviews. Such a framework could focus or structure in-class discussions, too. An example of this type of framework could follow the rhythmanalytical frames listed in Table 2. A distant aim could be the development of an openly accessible repertoire on rhythmanalysis for capturing rhythms in different contexts. The repertoire could provide orientation by identifying which types of methods are useful for the analysis of which types of locations or spaces along with the kind of data these methods generate, and the skills required for processing data.

More importantly, discussions between peers and instructors are fundamental to the constructivist sense-making process when students are first exposed to rhythmanalysis. Not only does this enable students and instructors to share resources and empathise with each other's teaching and learning processes, but it also enables opportunities for collective confirmation and boosts confidence as a part of the capacity-building for time-sensitivity in planning and design pedagogy. This aspect will, however, be constrained by the parameters of standard courses. In both case studies, students and instructors felt they did not have enough time to conduct the analyses because their processes of building the declarative knowledge base had to run in parallel to developing their functioning knowledge. This constraint also applied to the fieldwork, which could have been better initiated with additional and collective site visits. It is also important to keep in mind how opportunities for this are more constrained in fall and winter seasons as periods of daylight decrease and weather conditions become unwelcoming for certain fieldwork.

An improvement in designing future courses could introduce rhythmanalysis in an initial course unit that requests students to reflect on the relationships between time and space, followed by a course unit with more analytical and applied learning outcomes. This would decouple the parallel development of declarative and functioning knowledge bases and permit differentiation between concept versus design-oriented courses. It would, however, require that instructors dedicate a longer spread of time to rhythmanalysis. Another aspect that may be hindering students and their creative potentials for interpreting and representing rhythms may be conventional course output formats and evaluation rubrics. In the future of both case studies, the instructors plan to include reflective logs as personalised and formative means of assessing students' development of functioning knowledge in future iterations of the courses. Written reports and standard presentations or posters might be adequate ways for conveying socio-spatial patterns visually and in two dimensions, but they do not permit students to capture other experiential representations that might be more dynamic. Other forms of outputs could express more auditory, cinematographic, or performative representations. The inclusion of creative practitioners such as musicians and artists might also inspire students to think differently about rhythm, time, and space (Nevejan et al., 2018; Wunderlich, 2024). This would allow the students to expand their theoretical perspectives and find different ways to identify rhythms. As well, other formative deliverables for evaluation, such as through learning logs and reflections, could more effectively convey the process and quality of students' learning activities and achievements.

5. Discussion

The experiences here demonstrate that although complex and initially demanding, a rhythmanalysis approach to pedagogy is possible and positive. Students value time-sensitive approaches to spatial planning and design. In a final reflection session with students focusing on the Euregio Meuse-Rhine region, students shared the following:

> The temporal perspective shows the life that [is] going on in the spatial elements. And this vibrancy is creating those space[s] in the first place.
>
> [Rhythmanalysis] shows new patterns or trends within the spatial realm but [is] difficult to sometimes visualise…on a regional scale.

Whilst students agree that the pedagogical framework introduces them to the terminology or general tools needed to improve how they consider, conceptualise, and convey time-sensitive concepts, most students asked for more visualised precedents or prompts that are still absent or underdeveloped in spatial planning and design. Here we encounter two challenges. The first lies in making clearer the relationship between space and socio-spatial structuring devices such as clocks, routines, schedules, or seasons, while the second is that how rhythmanalysis or time-sensitive concepts are conveyed is still primarily based on textual forms of communication. For students with strengths in spatial design, this may be a challenge:

> Making urban design (and, in fact, architecture) students read is very difficult. It is traumatic to them, because they are simply unaccustomed to much reading. While it ought to be a "must component" in their proper training, it is a real challenge. (Lukovich, 2017, p. 94)

This emphasises the value of a well-thought-out and prepared introductory phase of teaching and learning experiences to help students effectively understand rhythmic patterns and rhythmanalysis before immersing themselves in the research and design work.

The experiences here aim to help instructors and students identify and analyse socio-spatial rhythms by integrating rhythmanalysis and constructive alignment concepts. The initial time-sensitive pattern categories (these are not exhaustive and are only a start) of *rhythms-in-space* versus *rhythms-through-space* along with the constructively aligned breakdown of two case studies may inspire or inform others' initial pedagogical experiences with rhythmanalysis. Our hope is to reduce burdens and anxieties concerning course design for instructors and fieldwork for students. The discomfort for instructors and students in exploring time-sensitive concepts is comparably, if not equally, high due to the novelty of the endeavour. Students who are not acquainted with ethnographic methods will also encounter discomfort because they leave the classroom confines for more experiential and qualitative forms of work, while they confront their own uncertainties associated with seeking out or conveying rhythmic patterns. For both teachers and learners, time-sensitive topics may present a vast territory and appear overly conceptual.

In terms of a general learning philosophy, our experiences highlight the advantages and disadvantages of a stronger process- and less product-based approach recommended in recent design-oriented scholarship (Marušić & Marušić, 2024). The insights here underline the development of different forms of knowledge

and pedagogical design for constructive alignment. Not only is there no singular form of knowledge, both declarative and functioning knowledge must be developed in parallel for students to learn how to apply rhythmanalysis. Supportive of this are teaching and learning activities that commit to mixed methods including ethnographic techniques. Moreover, designing for constructive alignment should focus on processual and formative approaches to facilitate the parallel development of both forms of knowledge. This means courses should intentionally create space for iterative consultations typical of design-oriented formats so that students are encouraged to consistently engage with rhythms that emerge in real-time during their work. Rhythmanalysis will involve both inductive and abductive approaches to exploring and analysing rhythms. In the experiences with the students' work in Amsterdam, an inductive approach encouraged students to not only go into the field but immerse themselves in certain contexts as volunteers or participants. In comparison, the work in the Euregio context encouraged inductive exploration of rhythms but developed abductive approaches as the students began with working hypotheses regarding patterns. In both pedagogical contexts, regular exchanges were held by the instructors with their students, which supported the iterative process of honing the working assumptions guiding their data collection. These provide space for students' feedback:

> I am still struggling to articulate an accurate hypothesis and set an adequate frame for the following month, so I will not get lost in the topic but be able to focus.

> Adding to the hypothesis: After the feedback today, I feel like I have to sharpen it and decide whether I want to focus on the rhythms of seasonal land use, consumer patterns, or a combination.

Finally, our experiences only scratch the surface of the diversity in time-sensitive perspectives and how this diversity affects students' learning processes. Beyond cross-cultural experiences highlighted in the work from the Amsterdam context, ecologically shaped perspectives from the work in the Euregio Meuse-Rhine context presented students with other challenges, which students shared:

> Beyond that, I find it difficult to grasp natural rhythms, also because in the face of climate change they are changing very fast.

> [The environment and climate] plays a major part as my whole project is dependent on river rhythms, post- and pre-flood rhythms. So, collecting this data is a bit tricky as it has sudden variations and indicators are changing.

This exposes external factors limiting how we can support time-sensitive concepts and capacities in design-oriented teaching and learning. This could exacerbate burdens for students with greater reliance on or preferences for quantitative data. Certainly, there is still much potential for improving on the initial pedagogical insights we present here.

6. Conclusion

In the sections above, we introduce how time-sensitive concepts and specifically rhythmanalysis may be integrated into pedagogy for spatial planning and design. This endeavour has weaknesses but is the first of its kind and inspired by initiatives from educational research on the application of rhythmanalysis *in* spaces

of teaching and learning. We admit that due to the exploratory nature of the work, the number of participants or their backgrounds affecting exact degree of comparability between the course designs was not ideal. One course included only three students at the graduate level, while the other undergraduate course was not as interdisciplinary. For the latter, it is important to know that the instructor came from a different disciplinary background and so interdisciplinarity was not entirely absent. Even the number of sessions of the courses differed and were defined by the curriculum of the respective universities. Nevertheless, this contribution does take steps to enhance design-oriented planning pedagogy by examining how rhythms of socio-spatial concerns could be taught and learned. We build on the developing debates in planning and design scholarship regarding time-sensitivity and its value for research methods as well as policymaking. The aims here are to innovate design-oriented education by providing initial conceptual structures that integrate rhythmanalysis and constructive alignment to help orient future courses and their activities. At the same time, it is an attempt to enhance the processes through which we pass on how we think (about) time and space as co-constitutive in socio-spatial theory-building and creative processes of spatial planning and design.

The differentiation between *rhythms-in-space* versus *rhythms-through-space* introduces conceptual structures intended to help familiarise students to rhythmic patterns in the socio-spatial features or phenomena that are both human and non-human. These help students identify and analyse through rhythmanalysis before considering design or policy interventions. Our experiences demonstrate that beyond conventional design-oriented pedagogical formats, it is essential to not underestimate the thoughtful preparation key to students' effective exposure to, learning, and application of rhythmanalysis. The ways for future work and improvement range from creating and pooling materials relating to representational precedents that are visual, exercises enabling formative learning, or even course designs that decouple the development of declarative and functioning knowledge. Our suggestions for next steps to build teaching and learning capacity for rhythmanalysis here are not all-encompassing but a constructive baseline for curious and committed planning educators and students ready to explore time-sensitive concepts.

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Conflict of Interests

The authors declare no conflict of interests.

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