ADDENDUM E: Biopics background and context

Below is a description in the four biopics investigations, which includes an outline of the following: the design brief of the active studio project, the role of the researcher, the workshop situation within the studio accommodation and the impact of the workshop on the completed design project. In addition, the impact moments identified in each biopic investigation are presented according to the qualitative data analysis and threshold concepts identified. Lastly, the relation of the disruptive activities and transformative focus of the workshop is considered in relation to the ethos of the school.

Consider **Addendum E** in conjunction with *PART 1 – Detailed biopics overview* (pages 131-142) and *Table 6-1* (page 131) in *Chapter 6 Biopic Investigations*.

Biopic 1: public university_b1

Design brief of active studio project: corporate office in CBD

The design brief for b1 is a corporate office design project, which considers agile workplace principles. The context is situated in the Pretoria CBD and a virtual building (an architectural project from a past MProf student) is used as the site. The brief requires students to identify a client informed by the mapping and contextual documentation and analysis of the context. This process is informed by a walk-about in the city between 4pm and 6pm on a winter's day. This immersive embodied experience provides a first-hand encounter of the realities of the city, as it shuts down at night. The two-hour walk-about stretches into the evening, as it is already dark returning to the starting point.

The design project is contextualised by the development of an urban block vision and framework by the interdisciplinary student teams (interior, landscape and architecture). Students spent two weeks familiarising themselves with the context, obtaining an intimate understanding of the unwritten and intangible scenarios, conditions and experiences they encounter. They formulate a grounded insight of the challenges of the bigger design concerns, framed by their personal points of reference. The urban block vision or framework the group adopts, outlines five points of importance as background to the design project: 1) connectivity to and of the city, 2) community engagement, 3) meaningful urban places, 4) greening the city, and 5) social inclusivity.

The brief requires students to interpret the corporate identity and culture of the selected client into a contemporary agile workplace design, taking into account the urban framework, to enable social interaction and meaningful relationships. The students' immersive experiences guide the selection of clients, as the companies proposed are all connected to larger urban issues in some way, being local start-ups, NGO's or community initiatives of corporates. These selections are informed by the students' direct perception when identifying the potential of the city, its people, their experiences and the realities of living in an interconnected network of urban flux. This is particularly noteworthy, as visualisation and imagination are required to make connections to the virtual building in the context.

Role of the researcher

As studio coordinator of the group, the researcher is directly involved in the studio and as a result, the students trust the focus and purpose of the workshop, regardless of its unfamiliar approach and activities. They embrace the disruption (emotional, cognitive and creative) and engage freely, although they might not always have been comfortable with the process. Because they are familiar with abstraction in design, due to other projects during the previous semester, they allow the process to unfold and to delve deeper into the design inquiry. They are participants not only contributing in the workshop as design research, but also participating in order to further their personal development. As such, the researcher performed her normal activities in the studio as an insider. Student interaction is a fluid process, as they feel at ease to connect with their peers. This studio atmosphere makes a positive impact on engagement and connection between students and the workshop activities. This is a familiar place where no judgements are passed, and as a result, students feel comfortable to express and share freely.

Studio accommodation and workshop situation

During the time of the workshop, the Boukunde building was renovated and the department temporarily re-located to the Groenkloof campus. The studio environment was situated within 'shed-like' structures, with large open volumes, good natural light and roller-shutter doors that open to the expansive gardens of the campus grounds. The interior arrangement of the studio allows each student adequate dedicated workspace. On the cold winter's morning, heaters ensured a warm studio and an informal coffee station for a hot drink before the activities began. During the morning, the roller shutter doors were opened and students moved freely between inside and outside and created their own workspace within the familiarity of their everyday studio setup.

Impact on completed design project

The impact of the workshop on the studio projects has limited effect. Most students consider the selection of a client in relation to the workshop activities and do not consider the concepts and approach in more depth. Some students follow a user-centred approach and focus on the social, dynamic conditions of living over static design expressions. Meaning-making in design also receives attention in selected projects where specific materials and personal relations to details are considered. In instances where the workshop approach is lost, students revert to a conventional spatial design approach. As a result, the richness fades and complexity and interpretation become more superficial and predictable. However, students show an awareness and concern for others on deeper levels, but the presentations show little evidence of its exploration and development, beyond the identification and selection of client. A good contextual understanding becomes visible, but it is not translated into a larger contextual meaning-making. Their own bias remains evident, demonstrating the difficulty to shift points of view and perspectives in the context of the larger design project.

The students that demonstrate an immersion in the project, which is derived from the workshop investigation, are able to form a connected inquiry. It seems that they are able to emotionally detach

from the process, resulting in deeper insights due to an objective understanding. Shifting between various personas and different ways of working assist the journey of transformation. Students are able to make conscious decisions to benefit the lives of people in other ways, through intangible means and on deeper levels.

Impact moments

The impact moments and threshold concepts are instances in the workshop and design project where small, but noticeable transformations are observed.

Table A: b_1 consolidated impact moments

Impact moments	Threshold concepts	Related literature
Sq_1 disruption : dissociation		
Emotional confrontation in the city – (prior experience)	Emotional disruption	Worldviews Ontological perspective
Imagination of self as city dweller – (problem statement)	**Perspective taking**, empathy Shifts between personas	Wicked problems Normative dissociation
Distilling essence and focus project – (keywords)	Contextual awareness Appreciative inquiry(potential)	**Contextual meaning** Abductive reasoning, framing
Zoom into micro scale encounters – Fluid scenarios (vignettes)	**Intimate interactions**, interpretation of conditions and situations Deep engagements	Spatial agency, **modal shifts** **Expanding empathetic horizon** Normative dissociation
Ways of engagement (process – 'how')	**Emotional-cognitive shifts**	Modal shifts Dialogue with the situation
Sq_2 human-centred approach and empathy		
Symbolism and abstraction (representation)	Transferral of understanding **Metaphor**	**Discursive design** Contextual meaning
Association and connotation (material use)	Meaning-making and message **Transference of new meanings**	Disruption (not solving problems) Connected / engaged learning
Process and approach Second life materials (critical artefacts)	Provocation Social commentary Design association and meaning	Wicked problems **Dialogue with the situation** Discursive design
Modal shifts (design actions)	Transactional encounters	**Perspectives**
Personal experience (small scale observations)	Making sense, insight **Affective-cognitive shifts**	Transformative learning
Sq_3 transformative engagement and other design agendas		
Walkabout in the city (prior experience)	Emotional attachment **Connected immersion**	Connected knowing Normative dissociation Disruption
Identifying potential (problem statement)	Imagining self as urban dweller Positive engagement	Normative dissociation Abductive reasoning **Appreciative inquiry**
Distilling the essence of the project (keywords)	Reframe design intentions	**Framing** Dialogue with the situation
Perspective shifts	**Modal shifts** Reaching beyond symptoms	Normative dissociation Wicked problems
Thinking and making abstractly (critical artefacts)	Symbolism **Meaning-making**	Discursive design Wicked problems Dialogue with the situation
Deep engagement with process (process driven)	Connected learning Contextual immersion	**Contextual meaning** **Citizenship; discursive design** **Discursive design**
Sharing with peers (bias, judgements)	**Challenge personal perspectives** World views	Points of view Habits of mind

Post studio project		
Emotional detachment	Perspective shifts	Normative dissociation
Objective stance after immersion	Human-centred design	Frames of reference
Imagine self as user	Empathy	**Expanding empathetic horizon**
	Design awareness	
Association and connotations	Meaning-making	**Contextual meaning**
Dialogue with self, process and	Engaged learning	Wicked problems
challenging matters	Connected knowing	Transformative learning
Commitment to issues	Agency	**Design citizenship**
Challenge bias	Judgement	World view

b1_threshold concepts

In biopic one, threshold concepts relate to broader societal issues and challenges that are contextually bound and experienced. No direct reference to workplace design or agile office design considerations feature anywhere in the workshop engagement. Instead, students are immersed in the city and reliving their embodied experiences. Could this be why only a number of them actively expanded the refocused approach in the design project? Nevertheless, threshold concepts reveal noteworthy findings, albeit mostly in the context of the workshop.

Transformative (shift perception, values, attitudes)
– Contextual meaning; connected knowing

Irreversible (concepts change)
– Perspectives; spatial agency
– 'feel' and 'act' to introduce to ethos of school

Integrative (not previously known, new information or meanings)
– Workshop 'forces' students to confront issues; worldviews; perspectives

Troublesome (reveal previous preconceptions)
– Contextual meaning – emotional disruption

Bounded (reconstruct worldviews)
– Refocus design agendas; citizenship designers

Relation to ethos of school

Considering the 'think', 'feel' and 'do' triad (Fisher & Clarke 2012) of engagement promoted by the department, the workshop shows that most students struggle to sustain 'feel' into the design projects. Those that made connected links benefitted most from the activities. Students express the value of engaged learning, although it is mostly contained in the context of the workshop. This attitude aligns with the department's newly established Unit for Urban Citizenship. The unit introduces engaged learning and participatory design research projects, where students are encouraged to become design citizens and activists for design making positive change. Normative dissociation also proves useful, as students are adopting and respecting different opinions and perspectives, to reveal new design agendas.

Biopic 2: comprehensive university_b2

Design brief of running studio project: convenience store in suburb

The brief for the active studio project for b2 focuses on the design of a neighbourhood convenience store in a suburban area and students are required to propose a familiar site as context. The client is a national brand and the project encourages student-client interaction, simulating a 'real-life' project from client briefing to interim meetings and design presentations. The standard programmatic requirements for conventional convenience stores are complimented by the inclusion of a local aspect inspired by the immediate context. The purpose is to inform the design conceptualisation of the new interior image and spatial articulation of the brand. Costing and budgeting are added realities to consider in the project.

Role of the researcher

Although the researcher was received with excitement during the introductory lecture two weeks prior to the workshop, students still experience her as an outsider or visitor to the studio. The unfamiliar perspective and ways of working introduced in the workshop, adds to this experience. Regardless of these emotions and feelings, students embraced the activities and fully participated, whether they felt comfortable or not. The researcher was a silent observer on the day and did not interfere in the activities, unless there were questions. Students responded spontaneously towards a request to provide post workshop feedback and they shared honest experiences and opinions. The strong peer interaction alleviated the perceived pressure of the researcher's presence. Regardless, they participated with rigour and enthusiasm.

Studio accommodation and workshop situation

The workshop took place in the interior programme's model building workshop, a shared space between the different years of study. On the day of the workshop, three desk clusters are appropriated for the duration of the session, and as students arrive, spontaneous groups are formed. No interaction is observed outside the groups, except during the selection of second life materials from the communal tables.

Impact on completed design project

Post workshop feedback reveals a logistical issue regarding the relation between the design project of the convenience store and the workshop. The timing of the workshop three weeks into the project (duration of project four weeks) is not ideal. As a result, it did not provide adequate time for students to immerse themselves in another way of thinking and engaging as part of the larger design process. For the 'plug-in' addition to have more effect, implementation within the first week of concept development is more suited. Nonetheless, some students report that the workshop made a difference in some way.

Impact moments

The impact moments and threshold concepts below show instances in the workshop and design project, where small but noticeable transformations occur. Some students made specific reference to aspects they felt made a difference in their work, especially to connect to the users' needs more directly.

Table B: b_2 consolidated impact moments

Impact moments	Threshold concepts	Related literature
Sq_1 disruption : dissociation		
Imagine self as customer (problem statement)	Cognitive disruption Emotional activator	Normative dissociation
Contextual exploration and imagination (keywords)	Contextual observation	Contextual meaning
Thinking in images (vignettes) – catalyst	Representation of relational conditions Dialogue with the situation	Modal shifts Expanding empathetic horizon Engaged learning
Disruption – cognitive, affective, creative	Shifts between personas Imagination and observation	Dialogue with the situation Engaged learning
Sq_2 human-centred approach and empathy		
Materials potential (second life objects)	Association and symbolism Representations and message	Discursive design provocation
Adopt view of customer Shift perspective	Expanded empathetic horizon Connected knowing	Normative dissociation Engaged learning Modal shifts
Reflection and interaction (peers and process)	Modal shifts Meaning-making	Contextual meaning Transformative learning
Process and approach Not solving problems	Disruption Abstraction	Discursive design Message and meaning
Personal experiences (feedback)	Immersive / imagined experiences Constructive criticism in pairs	Connected knowing Share, grow, transform
Sq_3 transformative engagement and other design agendas		
Disruption – cognitive, affective (problems statement)	Adopting customer perspective and experience	Expanding empathetic horizon Perspective change Normative dissociation
Articulating the essence of project (keywords)	Framing the project	Framing Appreciative inquiry
Modes of engagement Design actions (vignettes and critical artefacts)	Exploratory learning Abstraction Association with materials	Discursive design Modal shifts Dialogue with the situation (vs solution led goal analysis)
Discover depth and complexity	Affective, cognitive relations equilibrium	Separate – connected knowing balance
Post studio project		
Immersed engagement with process	New perspectives Other ways of inquiry	Dialogue with the situation Modal shifts
Stages in the process	Break down complexity	Phase model Dialogue with the situation
Adopt view of customers	Absorb in the situation Attentive imagined observation	Normative dissociation Expanded empathetic horizon

Materials and associations	Symbolism and connotations	Discursive design
	Meaning-making	Message, representation
Articulate design issues	Reflective practice	Problem framing
(cognitive, emotional)	Active experimentation	Critical reflection

b2_threshold concepts

Threshold concepts emerging from b2 do not provide a full scope for intervention, due to the late timing of the workshop. As a result, the *bounded* concepts cannot be identified beyond students' design awareness and intent. However, students do display a deeper understanding of design complexities in general.

Transformative (shift perception, values attitudes)

- Customer focused; expand empathetic horizon
- Critical reflection and peer interaction

Irreversible (concepts change)

- Perspectives; choice and agency

Integrative (not previously known, new information or meanings)

- Emotional and experiential conditions related to convenience store design
- Abstract meaning-making

Troublesome (reveal previous preconceptions)

- Immersive, imagined experiences
- Programmatic contextual knowing / meaning

Bounded (reconstruct worldviews)

- Awareness of preconceived ideas ('acting on' not yet visible due to late timing of the workshop)

Relation to ethos of school

The convenience store is an example of a project that connects to the city. This connection offers students opportunities to extend innovative thinking and ideas regarding human-environment needs. The familiar process of design inquiry students are used to, are disrupted with the workshop that opens another door to ways of engagement in the studio. Students are exposed to 'connected' actions that are immersive, interactive and hands-on. Because of this, students find their own interpretations and understandings into deeper insights into relational, emotional, pragmatic, contextual and social conditions. The ethos of the school is extended to also consider the intangible and behavioural aspects related to spatial design, through other ways to enable engaged learning.

Biopic 3: private design college_b3

Design brief of running studio project: luminaire design, open-ended use

The studio project brief of b3 is an energy efficient luminaire for a self-defined domestic interior. It dovetails with the requirements for the 2019 *PPC Imaginarium Awards*, emphasising innovative concepts and prototypes using PPC concrete. Students are challenged to "think laterally" and to question what light is, how it shapes spatial environments and express meaning, mood and atmosphere. The project objectives are to work with perception and deception, experiment with the unknown and with light as a medium. It has strong structural aims and focuses on material and technical concerns, in conjunction with prototyping, in the design process.

Role of the researcher

The researcher is experienced as an outsider, an intruder. The students are sceptical about the workshop process, facilitated by someone they do not know or trust. They question the intent of the activities and its alignment with their own studio leader's expectations. They are furthermore concerned with who will be involved in grading the projects and to what degree the stranger who introduced strange and intimidating ideas into the projects will be involved. As a result, students keep their distance and choose not to interact with the researcher. They do however participate with intent and purpose.

Afterwards, the studio master and researcher discussed the potential difference in students' experiences of the workshop should the studio master have facilitated the activities himself – someone they know and trust. Perhaps in this way, they would have been sensitised to another way of design inquiry quicker and with less anxiety. When a stranger presents something unfamiliar, they are outside their comfort zone. If they can challenge themselves beyond the discomfort of the disruption, they can increase their personal growth by embracing other design skills, to supplement the familiar conventional design process.

Studio accommodation and workshop situation

The studios at the school are shared between interdisciplinary groups of students of the same year, at different times during the week. Workspaces have a group cluster format where each student has a self-assigned workspace to support group interaction. The workshop takes place between 8h00 and 12h00 in summer time, during load shedding, which makes arriving on time challenging for students traveling long distances. Everyone needs time to settle down after arriving, after which the social conditions in the studio are relaxed. The degree of participation of students is noteworthy, with the majority actively immersed in the process. However, there are some showing disinterested for most of the workshop and as a result, do not produce enough to write for a critical reflection.

The studio coordinator reported afterwards that the researcher was perceived as an outsider, an intruder, someone the students did not really trust. This was due to the unfamiliar activities and focus of the workshop, outside the norm of the students' familiar studio process. Students perceived it as foreign and questioned the relevance, importance within the context of their luminaire design project.

Impact on completed design project

The interim critique midway through the design project reveals no relation to the workshop, besides exploration of alternative materials for prototypes. The designs are mostly shape driven and students investigate energy efficient lighting technologies. Feedback from the studio master reports that students enjoyed the workshop, as it fostered stronger iterative and critical reflective practices compared to the past two years. Students are more critical of their own processes. They focus on how the prototypes can be done, indicating their emphasis on process. In addition, they have a stronger research focus. Ideas are less predictable and more manufacturing ready. The focus is not only on user-object interface, but also on user-environment interface. Students consider how light becomes spatial, how people use light in space and its effect on an environment.

The impact of the workshop on the final luminaire prototypes indicate a variety of responses, ranging from conventional luminaire designs, to luminaires with spatial and atmospheric effects and human-object interface designs. The initial richness and complexity expressed in the workshop mostly relates to social matters, equity and inclusivity. This fades during prototyping for the design presentation and is replaced by an emphasis on manufacturing, material choices and detailing. Students refocus their attention to product as outcome, which overshadow the deeper explorations they uncovered in the workshop. The anxiety and pressure of making is compared to the unsettling disruption students experienced at the start of the workshop session. Only a quarter of the class complete prototypes, which address complex societal issues and integrate the workshop attitude and approach from their own accord. Concepts address health, physical and emotional wellbeing of people of all ages.

The transition from workshop to final prototype is therefore not easy. It takes time for thinking and actions to transform from initial indecisiveness and scepticism, where students are suspicious to make something without a result in mind, to engaged interaction. Students show awareness of personal intent versus intuition. However, reacting on that in the context of the luminaire prototyping remains a challenge.

Impact moments

The impact moments and threshold concepts show small but significant transformations, where the initial anxiety is replaced by an appreciation of learning new skills and ways of doing.

Table C: b3_consolidated impact moments

Impact moments	Threshold concepts	Related literature
Sq_1 disruption : dissociation		
Cognitive disruption (problem statement)	Contextualising luminaire in larger design discourse	Contextual meaning Normative dissociation
Distilling essence of focus project (keywords) – cognitive disruption	Default to the familiar Barriers to engagement / development	Dialogue with the situation Framing the project Developmental psychology
Creative and relational upset (vignettes)	Barriers to engagement Formal, shape driven	Attention based normative dissociation Mirror own bias, judgements (empathy)
Ways of engagement (process – 'how')	Disruptive practice Unfamiliar studio engagement	Disruption Barriers to engagement / development
Influence of design project brief	Dichotomy between product-driven focus and scenario-based inquiry	Transformative learning Modal shifts; perspectives Normative dissociation
Sq_2 human-centred approach and empathy		
Second life materials provocation	Meaning-making, symbolism	Discursive design Creative disruption
Free exploration (process driven)	Contextual awareness Co-development of problem-solution	Wicked problems Contextual meaning
Absorbed in process	Empathy Engaged learning	Expanding empathetic horizon Transformative learning
Relational conditions	Interrelationships	Connected knowing Normative dissociation
Focus on intangibles (peer interaction)	Dialogue (situation, process, peers) Empathy	Meaning-making Transformative learning
Sq_3 transformative engagement and other design agendas		
Focus on process (not product)	Cognitive disruption Narrative focus	Discursive design Message and representation
Anxiety and apprehension (problem statement)	Cognitive disruption Critical reflection	Points of view; bias Separate-connected knowing
Framing the issues (keywords)	Dialogue with the situation Reflective practice	Normative dissociation Framing; dialogue with the situation
Relational conditions (vignettes)	Situational awareness Empathy	Modal shift, human-centred focus Contextual meaning
Use of second life materials (critical artefacts)	Creative disruption Association and connotation	Modal shift; Meaning-making Discursive design
Connected engagement to workshop Perspectives	Socially inclusive Spatial agency	Engaged learning Citizenship
Post studio design project		
Prototyping (luminaire)	Explorative learning Modification of goals	Co-development of problem-solution Connected knowing
Abstraction and symbolism	Different views / perspectives Modal shifts	Normative dissociation Discursive design
Intimidating new process	Reflective practice Points of view	Modes of engagement Dialogue with the situation, Iteration
Deeper meanings in manufacturing	Meaning-making Complex design issues	Contextual meaning Situational awareness

b3_threshold concepts

Due to the nature of the design project brief, the bounded threshold concept remains hesitant at this stage. The emphasis on a product as outcome stifled an immersive and connected engagement. A quarter of students follow through on the workshop approach by integrating the design attitude into the prototype and final design proposal.

Transformative (shift perception, values attitudes)
– Situational awareness
– Reflective practice
Irreversible (concepts change)
– Dialogue with self, situation, challenges, process
Integrative (not previously known, new information or meanings)
– Perspectives
– Meaning-making through engaged learning
Troublesome (reveal previous preconceptions)
– Modes of engagement; process-driven
– Disruptive practice
Bounded (reconstruct worldviews)
– [Spatial agency; citizenship]

Relation to ethos of school

The school's emphasis on user centred design is complemented by the unusual workshop activities which introduces emotive, intangible and affective aspects. By shifting modes of engagement, students become comfortable to pursue iterative and explorative processes that address other design agendas, albeit in their own small ways. The 'process of making' becomes the context in this project. This is made possible through manufacturing, testing, reflecting, contextual consequences, and material and technical research. The workshop highlights the realities of living and its effect on lighting considerations, which increases the understanding of users in an environment. Students are challenged to explore design scenarios that are responsive, and some move beyond predictable and superficial reactions. They address complex design matters in order to make change through design.

Biopic 4: independent school of art and design_b4

Design brief of running studio project: artefact for exhibition setting

The *Critical Artefacts Seminar-Studio* is an interdisciplinary studio that combines senior undergraduate and [post] graduate students. It deals with body-space spatial concerns, object-space relationships, and the "ideas of temporality, gesture, identity, ownership and the social shaping of technology" (Project brief 2019). The studio's intent is to search for sophisticated tools to translate concerns as an artefact that critically engages the audience on a matter, instead of finding solutions. Pluralistic research methods are encouraged, combining empirical investigations and speculative explorations as biopic investigations (Critical Artefacts Seminar-Studio Course Material 2019).

The project requires students to define a matter of concern, giving commentary on the desire for, consumption of and relationship with material things. The project scope includes a project statement, a conceptual framework poster to visually communicate the matter and a critical artefact that abstractly makes the concerns visible in the public domain, for public and academic critique. This falls within the domain of discursive design (Tharp &Tharp 2018). The project stipulates the selection of one of the specified categories for the critical artefacts:

1) self-sufficient environments; 2) disobedient objects; 3) disruptive interactions; 4) cannibalistic machines; and 5) reflective conduits (Critical Artefacts Seminar-Studio Course Material 2019).

Role of the researcher

The researcher experienced feeling like an outsider or intruder during the workshop. Students continued with their work independently as part of the larger studio project. However, when the researcher engaged with students one-on-one, the issues of concern they identified as well as the difficulty they experienced to translate ideas into the project artefacts, were expressed. The interactions were constructive, although students remained aloof and apprehensive. Students responded politely and in detail, although with various levels of hesitation, as experienced by the researcher. Only one student integrated an aspect discussed during the course of the workshop at the presentation at the end of the evening. The rest of the students were reluctant or did not seem to consider these aspects in the presentation. It is presumed that the students were already on a path of investigation and did not 'trust' or allow an outsider to give another opinion. As with b2, the researcher speculates on students' perception of the validity of other opinions offered by an outsider. The reliance on the trusted opinion of their own studio master seems to be the only one that really 'counts', as was evident in the honest and spontaneous feedback in the reflective essays.

Workshop situation and studio accommodation

The researcher visited the school in March 2019 as an invited facilitator, to conduct the workshop as part of the critical artefacts project during the mid-term presentation. The workshop takes place during normal studio hours, 6pm to 9pm, however, the activities continued until 10pm during a very cold winters evening. On arrival, coats are neatly hooked; scarves and beanies removed and hot water is ready for a cup of coffee or tea. The studio setting is spread over two floors where each student has an individual workspace, away from their peers. Activities are performed independently, with peer interaction limited to the critical reflection at the end of the evening. Through observation, it is noted that students immersed themselves in the process, focusing on complex societal issues they identified.

The workshop is intended to refine the development of projects. During the course of the evening, the researcher spends time with students individually to determine the focus of each project and to reflect on their thinking and process to date. The workshop activities unfold differently to that of the other three biopics, due to the project's disruptive nature. Students firstly reflect on the issues identified in their work and focus on finding ways to make these visible in an abstract way, without solving the issues. As part of the preparation for the workshop, they complete a critical self-reflection, listing keywords and

document specific difficulties they are experiencing at that moment. These data sets are used as the problem statement, keywords and first critical reflection to correlate with the other three biopic investigations, and for consistency in the data. The initial posters presented at midterm, outline the matters of concern and extend the scope of data set. No vignettes are created, only selected diagrams. Only a couple of students choose to engage in the making of critical artefacts and only two integrate second life materials to explore abstract and symbolic exploration as part of the workshop. Students present their process development and conceptual posters at the end of the evening where everyone gives input and feedback.

Impact on completed design project

Due to the close alignment of the workshop to the studio design project, the impact of the workshop is limited. Students find themselves already within a 'disruptive' situation and the workshop activities become an extension. It is noteworthy that the students do not easily find an 'exit' from the disruption, even if an outsider's opinion is presented as an alternative and objective voice to deepen their understanding. The external examiner observes the same by noting issues related to critical reflection, critical theory, visual representation, project focus and design engagement.

Impact moments

Impact moments and threshold concepts are highlighted as a personal challenge; however, some find an expanded creative expression through the critical inquiry.

Table D: b4_consilidated impact moments

Impact moments	Threshold concepts	Related literature
Sq_1 disruption : dissociation		
Cognitive disruption (project statement)	Personal bias – commission (egocentric), omission (ignorance)	Worldviews Ontological perspective
Emotional confrontation (project statement)	Connected – separate knowing Perspectives	Procedural knowing Wicked problems Normative dissociation
Distilling essence and focus project (keywords)	Provocation Disruptive practice	Contextual meaning Framing; wicked problems
Perspective taking and bias (point of view)	Frame of reference Identity of designer	Modal shifts Empathetic – cognitive, affective
Ways of engagement (one dimensional – no vignettes)	Modal shifts Emotional-cognitive shifts	Modal shifts Dialogue with the situation
Sq_2 human-centred approach and empathy		
Making visible abstract or intangible concepts	Associations and connotations Symbolism	Discursive design Meaning-making
Connected-separate learning (challenge)	Emotional immersion Cognitive detachment	Expanding empathetic horizon Normative dissociation
Perspective shifts (challenge)	Modal shifts	Worldviews Frames of reference
Ways of engagement Design activities	Modal shifts Connected learning	Engaged learning Dialogue with the situation

Disruptive focus	Time and connection	Connected-separate knowing
Duration	Empathy	Contextual meaning
		Situational awareness

Sq_3 transformative engagement and other design agendas		
Project as provocation	Cognitive, affective, creative disruption	New design agendas
(disturbing *status quo*)	Design intent	Citizenship
Articulating project focus	Reframing design intentions	Framing
(problems statement and keywords)		Situational awareness
Perspective shifts	Dialogue with the situation	Modal shifts
Assuming role of the user	Reaching into complex matters	Perspectives
Thinking and making abstractly	Symbolism	Discursive design
Not solving problems	Abstraction	Meaning-making
Interpretation and representation	Theory entanglement	Ways of engagement
What is the message	Emotional attachment	Perspectives
Deep engagement	Connected-separate learning	Procedural knowing
(member or activist)	Personal bias; Empathy	Frames of reference

Post studio design project		
Emotional attachment	Perspectives	Normative dissociation
(connected, ignorant of other views)	Subjective immersion	Modal shifts
member > activist	Situational awareness	Contextual meaning
		Dialogue with the situation
Cognitive detachment	Perspectives	Normative dissociation
(separate, egocentric views)	Designer bias and judgement	Modal shifts
activist > advocate / champion	Routes to empathy	Expanding empathetic horizon
		Solution-led goal analysis
Critical and creative inquiry	Design commitment on behalf of others	Citizenship; Agency
	Reflective practice	Worldview; Frame of reference
Engaged design actions	Various design activities	Modal shifts
(think, feel, act, do, share)	Ways of engagement	Abstraction; Discursive design
Theoretical engagement vs	Design discourse	Research through design
Abstract representation	Design practice	Transformative learning

b4_ threshold concepts

Threshold concepts in b4 relate to the disruptive emphasis of the project and the workshop. This upsetting scenario becomes the catalyst for a change in thinking and design engagement. The shift in perception relates directly to the critical reflection of students' own values and worldviews. Considerations that become *irreversible* show their commitment to design engagement and to making an impact through design. Shifts in personas transition between 'connected' and 'separate' learning modalities. This remains a challenge until the end of the design project. The *troublesome* experiences of the disruptive practice have the largest influence on the way students ask questions and reflect on the larger design project intentions. All students realise their responsibility and express commitment to making positive social and societal change, by refocusing their design lenses toward people.

Transformative (shift perception, values attitudes)
- – Frames of reference
- – Worldviews, ontological change

Irreversible (concepts change)
- – Spatial agency
- – New design agendas

Integrative (not previously known, new information or meanings)
- – Connected-separate knowing
- – Expanding empathetic horizon

Troublesome (reveal previous preconceptions)
- – Disruptive practice – ways of design engagement
- – Discursive design; abstraction without solving problems

Bounded (reconstruct worldviews)
- – Citizen designers
- – Holistic learning

Relation to ethos of school

Within the school's ethos of 'provocative making, thinking and sharing', the transition in design engagement that proves the most challenging is the shift in design agendas – from problem solving to revealing issues. The students are hesitant to engage actively in the 'making' part of the process and as a result, the representation loses potential complexity and richness. It seems that students battle with 'what to do with the idea of provocation' and 'how to handle the disruption'. Although they are eager and committed to the approach, attitude and process, they are finding their individual ways of engagement.