

Implementing a Student-Centered, Competence-Oriented Learning Environment at Zambia University College of Technology (ZUT): A Theory U Approach

Betty Shitima Bweupe

Zambia University College of Technology, PO box 71601, Ndola, Copperbelt, Zambia

* E-mail of the corresponding author: bbweupe@zut.edu.zm

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Abstract

Purpose: The aim of this study was to investigate the impact of implementing a student-centered, competence-oriented learning environment at Zambia University College of Technology (ZUT).

Design/methodology/approach: Guided by Otto Scharmer's *Theory U* framework, a mixed-method action research design was employed. Fifty (50) students and one Information Technology lecturer participated in a structured coaching process aimed at co-creating and implementing a student-centered, competence-oriented learning environment. The lecturer's experiences were qualitatively mapped, while the effects of the *Theory U* approach on students were quantitatively assessed.

Findings: The study revealed a significant shift in the lecturer's awareness, following the progression of *Theory U*'s stages - open mind, open heart, and open will, resulting in new pedagogical practices emerging in the lecture room. Students reported experiencing the environment as more participatory and competence-driven, which positively influenced their engagement, collaboration, and learning approaches. Both the lecturer and students expressed intent to sustain this transformative approach, aligned with the principles of Education 4.0.

Practical implications: Findings underscore the importance of supportive preconditions for lecturers undergoing such shifts, and suggest that institutions of learning must intentionally nurture this transition. The integration of *Theory U* into teaching practice demonstrates potential to foster deeper student learning, critical skills development, and innovative capacity.

Conclusion: Action research proved to be a valuable strategy for examining the impact of competence-oriented, student-centered learning. The study recommends *Theory U* as a viable framework to guide higher education institutions in rethinking pedagogy in response to the demands of a VUCA (Volatile, Uncertain, Complex, Ambiguous) world.

Keywords: Theory U, Education 4.0, Student-Centered Learning, Competence-Oriented Learning Environment

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1. Introduction

The 21st century has ushered in a world defined by volatility, uncertainty, complexity, and ambiguity (VUCA). These dynamics demand new competencies from graduates, including problem-solving, critical reflection, collaboration, creativity, and adaptability (OECD, 2019). Reports such as *Trends Shaping Education* (OECD, 2019) and global dialogues including the Global Education Futures Summit (Luksha, et al., 2018) emphasize that traditional educational models must evolve to prepare learners for an unpredictable future. Teachers, therefore, are not only transmitters of knowledge but must also serve as innovators and knowledge workers who continuously improve their professional practice. Education as described by (Farrant, 1980) is "the total process of human learning by which knowledge is imparted, faculties trained and skills developed." This definition emphasizes a comprehensive view that education isn't just schooling or studying; it's the **entire process of human learning**, underscoring training of faculties, imparting knowledge, and skill development. It highlights formal, informal, and non-formal avenues of learning. This definition resonates with (Schleicher, 2012), who argues that innovation in curricula and pedagogy is key to equipping students for the challenges of a rapidly changing labor market. Furthermore, recent scholarship provides additional evidence for this shift. In a systematic review of Education 4.0 frameworks (González-Pérez & Ramírez-Montoya, 2022), highlight that

student-centered, technology-enhanced learning environments foster the development of future-ready competencies. Similarly, (Rienties, 2023) contextualizes Education 4.0 in higher education and computer science, illustrating how digital pedagogies can transform learning practices. Moreover, (Kerimbayev, et al., 2023) reinforce this by demonstrating that student-centered learning, supported by modern technologies in distance education, enhances both engagement and competency development. Together, these insights underscore the urgency of moving beyond traditional transmission models toward approaches that position learners as active co-creators of knowledge within digitally networked ecosystems.

Against this backdrop, this study investigates how lecturers can be guided into adopting a student-centered, competence-oriented learning environment grounded in *Theory U*. The core questions are:

- How does the Theory U approach impact teaching and student learning at ZUT?
- What challenges and barriers emerge during its implementation?

This research therefore, offers practical insights into how higher education institutions can reimagine learning environments to align with Education 4.0 and the demands of the VUCA world.

1.1 Statement of the Problem

The traditional teacher-centered learning environments dominate many educational systems, often leading to passive learning and inadequate development of critical 21st-century competencies (Mambwe, 2019); (Nyimbili, et al., 2018). In response, student-centered and competence-oriented approaches have gained traction globally. However, empirical evidence on their effectiveness in technical university contexts, particularly in Zambia, remains limited. This study therefore, seeks to fill that gap by implementing the *Theory U* at Zambia University College of Technology (ZUT). It examines how this framework influences lecturer awareness, pedagogical practice, and student engagement, while also identifying implementation challenges and pathways for sustainable transformation.

1.2 Research Objectives

1. To assess the impact of implementing a student-centered, competence-oriented learning environment at ZUT using the *Theory U* approach.
2. To identify challenges and barriers encountered during implementation and propose strategies to overcome them.

1.3 Research Questions

1. What is the impact of implementing a student-centered, competence-oriented learning environment at ZUT using the *Theory U* approach on students' acquisition of critical skills such as problem-solving, collaboration, and innovation?
2. What challenges and barriers emerge during implementation, and how can they be addressed?

2. Theoretical Framework

2.1 Theory U: A Framework for Transformative Learning

Theory U, developed by Otto Scharmer and colleagues at the Massachusetts Institute of Technology (MIT), provides a methodology for innovation and transformative change. It posits that the quality of outcomes in any system is directly linked to the quality of awareness, attention, and intention that individuals bring to their actions.

The framework follows a U-shaped process consisting of three core movements:

- **Sensing:** Suspending judgment and deeply observing current reality with openness to new perspectives.
- **Presencing:** Accessing deeper sources of knowing through an open mind, open heart, and open will - connecting to one's authentic self and future possibilities.

- **Realizing:** Co-creating new realities through prototyping, experimenting, and embedding insights into practice.

Beyond personal development, Theory U has been applied to organizational change, leadership development, and education, offering tools to cultivate creativity, collaboration, and innovation.

2.2 Why Adopt Theory U for this Study?

Theory U provides the central theoretical framework for this action research study. Developed by Otto Scharmer at MIT, it offers a structured process for leading change through co-sensing, presencing, and co-creating (Käufert & Scharmer, 2015) and (Scharmer, 2018). Over the past decade, Theory U has informed global innovation projects, particularly through *u.lab 1x*, a Massive Open Online Course (MOOC) launched in 2015. Since its inception, *u.lab 1x* has engaged more than 200,000 participants from over 180 countries, positioning itself as a widely adopted methodology for transformative leadership, innovation, and systemic change (Scharmer, 2019). When applied to education, Theory U provides a robust framework for reimagining learning environments in ways that are both student-centered and competence-oriented. This aligns with the principles of Education 4.0, which emphasize creativity, collaboration, adaptability, and the integration of digital technologies into pedagogy (Doucet, et al., 2018) (González-Pérez & Ramírez-Montoya, 2022); (Rienties, 2023). Student-centered approaches supported by Education 4.0 encourage learners to take an active role in shaping their learning journeys, moving beyond rote memorization toward deeper engagement and problem-solving (Kerimbayev, et al., 2023); (Laenens, et al., 2018). By integrating Theory U with Education 4.0, this study highlights the potential of awareness-based action research to foster profound shifts in both teaching and learning. For educators, adopting Theory U encourages movement from habitual teaching practices toward more open, reflective, and innovative pedagogies. For students, it creates environments where deep learning and competence development can thrive, thus preparing them for the uncertainties of a VUCA-world (OECD, 2019) (Schleicher, 2012).

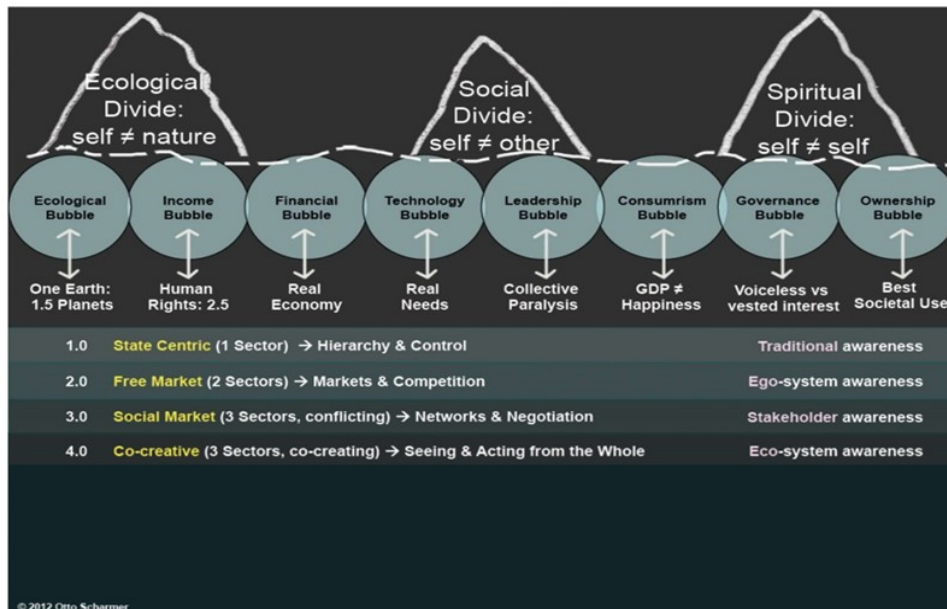
2.3 An Entire Society in Evolution: From Icebergs to Paradigm Shifts

Scharmer and Kaufer (2015) argue that we are living in profoundly disruptive times, marked by financial instability, climate change, depletion of natural resources, rising levels of burnout and depression, and a widening wealth gap. They describe these crises as manifestations of three fundamental divides: the ecological divide, the social divide, and the spiritual-cultural divide. While troubling in themselves, these divides represent only the visible surface of deeper systemic issues. Beneath the surface lie entrenched paradigms and institutional logics - what Scharmer terms the “**blind spot**”- that perpetuate existing problems by preventing individuals and organizations from seeing the whole system (Scharmer, 2018). The iceberg metaphor (see Figure 1) illustrates how visible symptoms of crisis are rooted in hidden structures and mental models that remain largely unaddressed.

Education is not isolated from these broader dynamics. As society evolves under the pressures of volatility, uncertainty, complexity, and ambiguity (VUCA), education systems must also evolve to bridge these divides (OECD, 2019). The emergence of Education 4.0 represents such an evolutionary step, positioning education as a driver of societal transformation rather than a passive responder (González-Pérez & Ramírez-Montoya, 2022). Education 4.0 frameworks emphasize personalized, student-centered, and technology-supported learning ecosystems that foster adaptability, collaboration, creativity, and critical thinking (Rienties, 2023) (Kerimbayev, et al., 2023).

Integrating Theory U into this landscape provides a methodological pathway for bridging the systemic divides identified by Scharmer and Kaufer. Awareness-based action research, as developed within Theory U, enables educators and students to collectively sense emerging futures and prototype innovative solutions. In doing so, it addresses not only the ecological, social, and cultural divides, but also the pedagogical divide between traditional, transmission-based education and the participatory, co-creative environments required in Education 4.0 (Laenens, et al., 2018); (Scharmer & Kaeufer, 2015). Thus, Theory U and Education 4.0 converge in their response to society in evolution: both call for deeper shifts in mindset, structure, and practice. By fostering reflective, student-centered, and systemically aware learning, they equip learners and educators alike to engage meaningfully with the challenges and opportunities of a rapidly changing world.

Table 1. The iceberg model: symptoms, structures, thought and sources



Adopted from: (Scharmer & Kaeufer, 2015).

Systems that were not designed to learn are often the result of these ‘bubbles’ and structural disconnects. Such systems prevent decision-makers from directly experiencing the consequences of their choices on wider populations. As a result, institutions tend to adapt too little and too late, reinforcing a cycle of delayed responses to emerging crises. Scharmer (2015) emphasizes that this inability to effectively address today’s issues stems from entrenched economic patterns of thought. While those patterns were useful in earlier contexts, they have limited relevance for the complex, interdependent challenges of our present time. Figure 1 and 2 illustrates this evolution, showing the three divides, their underlying systemic bubbles, and the four stages of economic paradigms. The trajectory begins with the state-centric model (1.0), characterized by coordination through hierarchy and centralized control in a single-sector society. This was followed by the free-market model (2.0), which introduced a second (private) sector and emphasized coordination through market forces and competition. The next stage, the social-market model (3.0), was marked by the emergence of a third (NGO) sector and coordination through negotiation among organized interest groups. Finally, the co-creative ecosystem model (4.0) has emerged, distinguished by the rise of a fourth sector that creates platforms and enables cross-sector collaboration, bringing together stakeholders from all spheres of society.

Table 2. Alignment of Economic Paradigms with Educational Paradigms

Economic Paradigm	Key Features (Scharmer, 2015)	Corresponding Education Paradigm	Educational Characteristics
State-centric (1.0)	Coordination through hierarchy and centralized control; single-sector society.	Education 1.0	Teacher-centered, authoritarian instruction; knowledge transmitted top-down; students as passive recipients.
Free-market (2.0)	Coordination through market forces, competition; introduction of private sector.	Education 2.0	Standardized curricula and assessments; competition-driven; measurable outcomes prioritized over creativity.
Social-market (3.0)	Coordination through negotiation among organized interest groups; inclusion of third sector (NGOs).	Education 3.0	Multi-stakeholder participation (NGOs, civil society, international bodies); emphasis on equity, values, and social responsibility; reforms remain incremental.
Co-creative ecosystem (4.0)	Cross-sector collaboration enabled by platforms; integration of all societal spheres; focus on innovation.	Education 4.0	Student-centered, competence-oriented learning; teachers as facilitators; digital technologies and partnerships leveraged; emphasis on collaboration, creativity, and adaptability in a VUCA world.

The above table shows how economic and educational paradigms evolve in parallel. As societies move from hierarchical, siloed systems to co-creative ecosystems, education shifts from teacher-centered, performance-driven models to participatory, competence-oriented learning. Scharmer (2019) extends this idea across finance, healthcare, education, and governance, where each domain's "operating system" adapts to broader social and economic changes. The progression illustrates a universal shift: systemic transformation opens space for innovation, with Table 2 mapping economic paradigms to corresponding educational models shaped by coordination mechanisms, stakeholder roles, and underlying logics (World Economic Forum, 2020).

OS	Learning	Health	Farm & Food	Finance	Governance
1.0: Input and authority-centric	Traditional teacher-centric	Traditional doctor-centric medicine	Traditional farmer-centric	Traditional Financial Capital	1.0 Visible hand: <i>Hierarchy</i>
2.0: Output and efficiency-centric	Testing: bulimia learning: <i>fast in, fast out</i>	Evidence based medicine	Industrial agriculture: monoculture	Extractive Capital: externality blind	2.0 Invisible hand: <i>Market</i>
3.0: Outcome- and user-centric	Leamer-centric	Patient-centric medicine	Organic Ag: reduce negative footprint	Impact investing: winners take all	3.0 Organized interest groups: <i>Lobbying</i>
4.0: Co-creative and eco-system-centric	Activate deep sources of learning	Strengthening sources of well-being	Food as medium for healing planet and people	Generative capital: transforming the system	4.0 ABC: <i>Awareness-Based Collective action</i>

Figure 1. Changing operating systems in different areas of society: Adopted from: (Scharmer, 2019)

Thus, within the education domain, these systemic shifts are particularly evident. The Education 1.0 model mirrored the state-centric paradigm, where teaching was primarily authoritarian, content was transmitted top-down, and the role of the student was largely passive - receiving rather than co-creating knowledge. With the

transition to Education 2.0, influenced by free-market logics, competition and standardized assessments became the dominant mode of coordination. While this model expanded access and drove measurable outcomes, it often reduced learning to performance metrics, leaving little room for creativity or critical engagement.

The Education 3.0 stage, paralleling the social-market model, introduced broader stakeholder participation. Here, NGOs, civil society, and international organizations played increasing roles in shaping curricula, promoting equity, and embedding values such as social responsibility. Yet, as Scharmer notes, even these reforms remained largely incremental, still constrained by old patterns of thought.

The emerging Education 4.0 represents a profound paradigm shift. Rooted in the co-creative ecosystem logic, it emphasizes student-centered, competence-oriented learning environments where teachers act not as sole transmitters of knowledge, but as facilitators of discovery, collaboration, and innovation. This model leverages digital technologies, cross-sector partnerships, and participatory methodologies to prepare learners for a volatile, uncertain, complex, and ambiguous (VUCA) world. In this sense, Education 4.0 does not merely reform existing practices; it redefines the very purpose of education - moving from transferring what is known to co-creating what is emerging.

By situating education within this broader systemic transformation, Scharmer's framework, when read in conjunction with Table 1 and 2 illuminates why traditional teaching approaches are increasingly insufficient. They belong to earlier paradigms that no longer align with today's complex realities. Instead, what is required are learning ecosystems that foster critical thinking, creativity, empathy, and adaptability.

This context therefore, provides the theoretical grounding for the present study, which investigates the implementation of a student-centered, competence-oriented learning environment at Zambia University College of Technology through the lens of Theory U.

2.4 Education of the Future (4.0)

According to Scharmer and Kaeufer (2015), the education system is undergoing a profound transformation, one that pivots on the evolving relationship between learner and educator. This institutional transformation can be understood as a progression through four stages of development:

- **Education 1.0** – an input – and authority-centered, lecturer-driven model, structured around hierarchy and content delivery.
- **Education 2.0** – an outcome-centered and testing-driven system, where standardized examinations define learning success.
- **Education 3.0** – a student-centered and learning-driven approach, positioning lecturers as facilitators or coaches.
- **Education 4.0** – a co-creative and presencing-driven model, where education fosters creativity, entrepreneurship, and deep personal transformation (Refer to *table 3*). Reimagining education for the rapidly evolving 4.0 era requires more than raising test scores or expanding curricular offerings. A pedagogy is emerging that places at its core the recognition and maximization of each student's unique potential. Within this context, different systems frame the challenges differently:
 - Some perceive a **performance crisis** (Education 2.0) and respond by focusing on improved test results.
 - Others recognize a **process crisis** (Education 3.0) and emphasize student-centered practices, such as coaching and personalized learning.
 - A select few discern a **crisis of profound human transformation** (Education 4.0), seeking to unlock students' deepest capacities for creativity, entrepreneurship, and social innovation.

For Scharmer, only Education 4.0 offers a response adequate to the scale of today's global challenges. Neither Education 1.0, 2.0, nor 3.0 can address the interconnected crises of climate change, inequality, and social fragmentation. What is required is not merely reform, but a **shift in consciousness** that redefines the very purpose of education. This perspective is echoed by (Doucet, et al., 2018), who argue that navigating education during extraordinary technological and social upheaval demands confronting complex moral, ethical, and pedagogical questions. Teachers, located at the frontline of this transformation, are essential in ensuring

equitable learning outcomes. However, Doucet et al. caution that relying solely on teachers is not enough – broader systemic reforms are essential to prevent education from reinforcing existing inequities. This aligns with findings from systemic analyses, such as Elayyan, which reveal that successful transformation in IR4.0 education requires comprehensive institutional shifts in curriculum, learning environments, and teacher-student roles (Elayyan, 2021).

2.5 Embracing the Future

In response to these challenges, Scharmer and colleagues developed **Theory U** as both a methodology and a framework for guiding education – and society – towards the 4.0 paradigm. Theory U provides a structured process for suspending old patterns of thought and connecting to deeper sources of knowledge, thereby enabling transformative change.

The methodology unfolds in two movements:

- **The left side of the U (the descent):** This involves suspending habitual ways of thinking (“downloading”), redirecting attention to perceive with fresh eyes, and letting go of past assumptions in order to access a deeper field of awareness (*presencing*).
- **The right side of the U (the ascent):** From this deeper source, new possibilities are crystallized (“letting come”), prototyped through action and experimentation, and ultimately embodied in practice, integrating head, heart, and hands in a unified approach. This journey, from “letting go” to “letting come” – is what enables educators and learners to co-create the future rather than reproduce the past. As illustrated in Figure 4, Theory U serves as a bridge between the recognition of today’s crises and the realization of transformative, future-oriented educational practices.

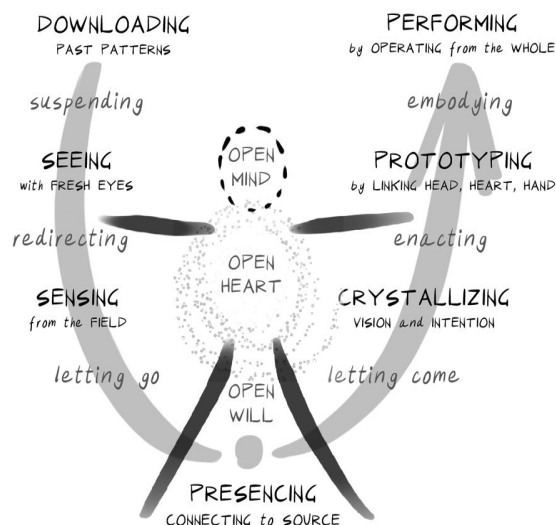


Figure 2. The different steps of Theory U: Adopted from (Scharmer,2018)

An **open heart, mind, and will** are essential prerequisites for engaging in the U-process. Without these conditions, it is not possible to connect to the deeper sources of knowing that Theory U seeks to access. The U-movement can be undertaken individually, within groups, or across larger systems. Scharmer (2015) outlines a variety of methods for applying these steps – ranging from personal practices to group-based interventions – further elaborated in his publications and online courses (MOOCs). While a detailed exposition of these techniques lies beyond the scope of this study, it is important to emphasize that Theory U places particular importance on **inclusive engagement with all stakeholders**. Through this, participants are able not only to *co-create the future they wish to see*, but also to collectively *sense the social field* in which they are embedded. Scharmer’s framework also bears the imprint of **IDEO’s design thinking approach**, which highlights the centrality of a human-centered process in fostering innovation (Kelley & Kelley, 2013). This intersection

underscores the broader relevance of Theory U, situating it within contemporary movements that prioritize empathy, collaboration, and creativity as drivers of systemic transformation.

In light of these dynamics, this study adopts Theory U as both a theoretical framework and a methodological orientation. Its emphasis on awareness-based action research provides a structured process for engaging participants in cycles of sensing, presencing, and co-creating solutions to educational challenges. At the same time, Education 4.0 principles guide the operationalization of these processes within student-centered, competence-oriented, and technology-enhanced learning environments. Together, these frameworks inform the research design, ensuring that the methodology not only investigates current practices but also contributes to the transformation of educational systems in alignment with the needs of a society in evolution.

2.6 Deep Learning Approach

Education 4.0 emphasizes co-creative, ecosystem-oriented learning that fosters deep approaches characterized by critical thinking, problem-solving, collaboration, and knowledge transfer. Research shows that student-centered, competence-oriented environments, when coherently designed and aligned with assessment and outcomes, promote such deep learning (Biggs, 1996; Baeten et al., 2010; Dochy et al., 2003; (Strobel & Van Barneveld, 2009); Freeman et al., 2014). Empirical studies confirm these benefits in fields such as computer science and distance education, where active and technology-enhanced pedagogies enhance engagement, autonomy, and competence (Laenens et al., 2018; González-Pérez & Ramírez-Montoya, 2022; Rienties, 2023; Kerimbayev et al., 2023). Grounded in transformative learning theories (Mezirow, 1997; Argyris & Schön, 1978; Scharmer & Kaeufer, 2015) and (National Research Council, 2012). Together, these elements reflect the learner's capacity not merely to retain information but to connect, apply, and internalize knowledge in meaningful ways. This study therefore employs a t-test to examine whether implementing a competence-oriented learning environment at ZUT leads to measurable shifts in students' learning strategies, engagement, and motivation. Furthermore, based on validated scales measuring these constructs, Laenens et al. (2018) designed a questionnaire to assess the extent of deep learning. For the purpose of this research, the same instrument was adopted to ensure both **reliability** and **comparability** of findings. Building on this foundation, this study seeks to determine whether implementing a student-centered, competence-oriented learning environment at ZUT produces a measurable shift toward deep learning among participating students. Specifically, we ask:

1. What is the impact of implementing a student-centered, competence-oriented learning environment at ZUT using the *Theory U* approach on students' acquisition of critical skills such as problem-solving, collaboration, and innovation?
2. What challenges and barriers emerge during implementation, and how can they be addressed?

By addressing these questions, the study contributes empirical evidence to ongoing debates about the effectiveness of Education 4.0 pedagogies. The introduction and theoretical framework thus lead naturally into the **Methodology section**, where the research design, participants, instruments, and data analysis procedures are outlined in detail.

3. Methods

3.1 Research Design

This study employed an Action Research Design (ATD) integrating both quantitative and qualitative approaches. Action research was chosen because it allows for intervention while simultaneously generating knowledge and theory (Billiet & Waage, 2011). Within this framework, the researcher assumed the role of both facilitator and investigator, guiding the intervention while observing its impact. The intervention consisted of implementing a student-centered, competence-oriented learning environment, designed through the Theory U approach and principles of Education 4.0. Its impact on students' learning approaches was measured using pre- and post-tests, with additional qualitative data collected through open-ended questionnaires and a semi-structured lecturer interview. The guiding research question was:

What is the impact of a student-centered, competence-oriented learning environment on students' learning using Theory U approaches?

3.2 Participants

The study was conducted in a second-year Information technology program, Communication Skills at the Zambia University of Technology (ZUT). The class was taught by *Lecturer Makasa*, a 41-year-old faculty member who expressed interest in professional growth and experimenting with student-centered pedagogy.

- **Students:** A total of 105 students (aged 18–23) were enrolled in the course and completed the questionnaire at the start. However, only fifty of these, completed both pre- and post-tests and were included in the final sample for quantitative analysis.
- **Lecturer:** One lecturer, serving as the main course instructor, participated in the intervention and subsequent interview.

The researcher co-lectured one hour weekly, while the main lecturer taught three hours weekly

3.3 Instruments

1. Student Questionnaire

A validated instrument developed by Laenens et al. (2018) and (Kristien, 2019) was used to measure learning approaches. The questionnaire contained 78 items across 13 scales, grouped under regulation strategies, motivation, social learning, and academic competence. Responses were scored on 5-point Likert scales. Minor contextual adjustments were made for relevance.

Overview of Learning Aspects and Scales

Category	Scale	Description
Regulation Strategies	Self-management	Active regulation of one's own learning process
	External control	Reliance on lecturers/materials for guidance
	Helplessness	Perceived inability to manage learning effectively
Motivation	Intrinsic motivation	Desire to learn out of personal interest
	Extrinsic motivation	Desire to learn to meet external expectations
	Demotivation	Reported lack of motivation
	Self-efficacy	Confidence in one's learning abilities
Social Learning	Peer relations	Perceived peer support
	Guidance lecturers	Perceived support from lecturers
	Student involvement	Participation and engagement in learning
	Collaboration	Preference for teamwork over competition
	Study pleasure	Enjoyment derived from learning
Academic Competence	Academic competence	Confidence in academic skills

2. Qualitative Questions

Open-ended questions were included in the post-test to capture students' reflections on differences between traditional and student-centered learning environments, as well as their evaluation of the Project.

3. Lecturer Interview

A semi-structured interview was conducted with the lecturer after the intervention. The interview guide was based on Scharmer & Kaeufer's (2015) framework for awareness-based action research. The session was audio-recorded, transcribed, and thematically analyzed.

3.4 Procedure

The intervention was carried out over a five-week period (June–July 2024) and followed these steps:

1. Pre-Test (Baseline Measurement)
 - All 105 students completed the questionnaire at the start of the course. Participation was voluntary and anonymous.

2. Post-Test (Impact Measurement)
 - At the end of the intervention, only fifty students completed the same questionnaire and responded to qualitative questions.
 - Fifty students completed both pre- and post-tests, forming the matched dataset.
3. Lecturer Interview
 - On July 29, 2024, a semi-structured interview was conducted to document the lecturer's evolving awareness, challenges and reflections on the intervention.

3.5 Data Analysis

- Quantitative Data: Responses from the 50 matched pre- and post-tests were entered into Excel and analyzed using **RStudio**. Paired t-tests were conducted to evaluate changes in students' learning approaches across the 13 scales.
- Qualitative Data: Student reflections and the lecturer interview transcript were analyzed using thematic analysis to identify patterns related to student experiences and lecturer awareness.

4. Findings

4.1 Quantitative Analysis

A repeated-measures design using paired-samples t-tests was employed to examine changes in student learning approaches ($n = 50$). Reliability analysis confirmed that 12 of the 13 scales demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.63$ – 0.92). The self-management scale ($\alpha = 0.52$) fell below the threshold and was therefore excluded from further analysis.

Table 3. *Quantitative Results presents descriptive statistics, t-test outcomes, and effect sizes.*

Learning aspect Scales	Pretest		Post-test		Paired t - test			
	M	SD	M	SD	T	Df	P	Cohen' s d
1. External control	3.417	0.600	3.476	0.605	0.698	46	0.489	0.102
2. Helplessness	2.694	0.724	2.413	0.693	-2.960	47	0.005	-0.427 (S)
3. Intrinsic motivation	2.126	0.703	2.847	0.794	7.496	46	1.651e -09	1.093 (L)
4. Extrinsic motivation	3.041	0.772	2.888	0.701	-2.188	47	0.034	-0.315 (S)
5. Demotivation	2.812	0.899	2.435	0.943	-2.411	46	0.020	-0.352 (S)
6. Self -efficacy	3.115	0.695	3.505	0.683	3.293	47	0.002	0.475 (S)
7. Peer relations	3.087	0.742	3.770	0.727	5.847	47	4.581e -07	0.844 (L)
8. Guidance Lecturers	3.505	0.885	3.770	0.635	2.408	47	0.020	0.348 (S)
9. Student Involvement	2.771	0.624	3.311	0.674	5.036	46	7.794e -06	0.735 (M)
10. Collaboration	3.904	0.622	4.284	0.690	2.763	44	0.008	0.412 (S)
11. Study pleasure	2.055	0.712	3.472	0.735	11.233	48	4.922e -15	1.605 (L)
12. Academic Competencies	2.802	0.632	3.352	0.632	5.463	46	1.833e -06	0.797 (M)

Across most scales, significant improvements were noticed ($p < .05$), with the exception of external control. The pattern of change reveals both a reduction in maladaptive orientations and an enhancement of positive learning dispositions. Specifically:

- **Reductions** in helplessness, extrinsic motivation, and demotivation suggest a decline in dependency and avoidance tendencies.
- **Increases** in intrinsic motivation, self-efficacy, peer relations, lecturer guidance, student involvement, collaboration, study pleasure, and academic competencies point to stronger engagement and the development of deeper learning approaches.

These results collectively indicate a positive shift toward more autonomous, motivated, and collaborative learning behaviors.

Effect Size and Robustness Analysis

Effect size analysis provided further insight into the magnitude of observed changes:

- **Large effects** were found for intrinsic motivation, study pleasure, and peer relations.
- **Medium effects** emerged for student involvement and academic competencies.
- **Small effects** were evident for self-efficacy, lecturer guidance, and collaboration.
- **No effect** was detected for external control.

To account for multiple comparisons, a Bonferroni correction was applied (adjusted $\alpha = 0.0042$). Results confirmed robust significance for self-efficacy (small effect), student involvement and academic competencies (medium effects), as well as intrinsic motivation, study pleasure, and peer relations (large effects).

Overall, the quantitative evidence demonstrates that the student-centered, competence-oriented learning environment substantially enhanced deep learning strategies, providing strong support for **Research Question 1**.

Research Question 2

To identify challenges and barriers encountered during implementation and propose strategies to overcome them.

4.2 Qualitative Analysis

4.2.1 Student Perspectives

Post-test reflections ($n = 50$) revealed both the challenges encountered and the benefits experienced during the intervention.

- **Valued aspects** most frequently highlighted were group work and collaboration (25 students), engaging and creative assignments (15), freedom of choice (14), autonomy and independence (9), and creativity (7).
- **Challenges** included perceptions of the program as demanding and time-consuming (5), chaotic at times (4), and requiring adjustments to grading approaches (3). A small group (5) emphasized the need for more time to engage with the learning tasks.

Despite these challenges, a majority of students emphasized positive outcomes. Key takeaways included exposure to new literary ideas (28), strengthened peer partnerships (13), improved planning and independent study skills (6), enhanced communication (4), and creative approaches to literature (4). Importantly, 45 of 50 students expressed a desire for similar learning environments in the future.

Overall, students reported a sense of greater autonomy, creativity, problem-solving ability, and empowerment. Many described lecturers as acting more like coaches than traditional instructors, reflecting a shift in the student–teacher dynamic.

4.2.2 Lecturer Perspective

From the lecturer’s viewpoint, the intervention was described as a transformative professional experience. Initially motivated by curiosity and collaboration, he identified several critical insights:

- The **Appreciative Inquiry approach** fostered openness, positive engagement, and constructive dialogue.

- The experience was both **energizing and demanding**, requiring additional workload but yielding deeper student interaction.
- The process demanded a willingness to **“let go” of traditional teaching patterns**, which paralleled the developmental stages of Theory U, despite the lecturer’s lack of prior exposure to the framework.
- Effective implementation required **training and ongoing professional support**, particularly in balancing facilitation with guidance.
- Co-teaching and coaching emerged as valuable practices, with the lecturer describing the process as “challenging but rewarding” and expressing a strong intention to integrate these methods into his future teaching.

Synthesis

Findings from both student and lecturer perspectives underscore that while the intervention presented challenges, particularly in terms of workload, time demands, and adapting to new methods; it generated significant benefits. Students experienced enhanced autonomy, creativity, and collaboration, while the lecturer underwent a professional mindset shift that reinforced his openness to student-centered pedagogy.

Together, these results indicate that the intervention not only advanced student learning (RQ1) but also addressed **Research Question 2 (RQ2)** by highlighting the challenges of implementation and identifying strategies for overcoming them: building in more structured time, refining assessment methods, and providing lecturer training and support. The dual transformation of students and lecturer alike suggests strong potential for the sustainability of Education 4.0 practices.

5. Discussion

This study engaged both the theory and practice of *Theory U*, applied within a higher education context. Inevitably, action research involves a degree of subjectivity, given the researcher’s active role in the process. While I sought to minimize personal influence, my engagement and the interactive nature of coaching were integral to the outcomes. It is possible that findings would differ under another researcher’s facilitation—a common challenge and strength of action research. Despite these limitations, the study demonstrated meaningful results within a short timeframe. The combination of quantitative and qualitative evidence strengthens the reliability of the findings, even within a relatively small sample of 55 students and one lecturer. Notably, students reported shifts in motivation and engagement, illustrating that competence-oriented, student-centered environments foster deeper learning. However, the limited scale of the intervention highlights the need for replication across diverse contexts, subjects, and institutions to validate and expand these insights. The prototype learning environment was not flawless. Adjustments were made throughout implementation as new questions and uncertainties emerged. This reflects the very essence of co-creation as an iterative process – one that values continuous feedback and reflection. The outcomes reaffirm that sustainable transformation in education is less about perfect design and more about cultivating adaptive, evolving practices.

This research offers practical inspiration for educational leaders, lecturer-coaches, and institutions. A forward-looking learning ecosystem requires more than technology or infrastructure; it demands leadership that energizes staff, empowers educators, and provides safe spaces for experimentation. It calls for teachers who encourage innovation, embrace failure as part of growth, and nurture collective imagination about the future. Importantly, transformation must include early adopters, hesitant participants, and even resistant educators—ensuring that all voices contribute to the shared journey of change.

5.1 Limitations and Future Research

This study was limited in scope to a single lecturer and a cohort of 50 students within one institutional context. While the mixed-methods approach enhanced the credibility of the findings, the small sample size restricts the generalizability of results. The researcher’s dual role as facilitator and observer also introduced potential bias, even though efforts were made to minimize personal influence.

Future research should expand to multiple lecturers, disciplines, and institutions in order to test the robustness of these findings across diverse contexts. Longitudinal studies would also be valuable to assess the sustainability of deep learning approaches over time. Additionally, comparative studies between traditional teaching methods and

Theory U-inspired interventions could provide further evidence of effectiveness. Finally, exploring the role of institutional leadership and policy frameworks in enabling or hindering such innovations would enrich the broader understanding of how to scale awareness-based educational change.

6. Conclusion and Recommendations

We live in a disruptive, volatile, uncertain, complex, and ambiguous (VUCA) world that demands continuous renewal and social innovation in education. Otto Scharmer's **Theory U** offers a transformative framework for co-sensing, presencing, and co-creating new learning pathways within this reality. In the context of **Education 4.0**, it promotes a holistic model of teaching and learning that integrates cognitive, emotional, and social dimensions -empowering both educators and learners to co-create meaningful educational experiences.

This study explored how Theory U can be practically applied to foster a **student-centered, competence-oriented learning environment** that supports deeper and more reflective learning. Conducted over six months through an **action research design**, the study engaged **105 students**, of whom **55 voluntarily responded to a structured questionnaire**, and one lecturer who implemented the pedagogical innovation. The use of **mixed methods** allowed for both quantitative and qualitative insights to be drawn.

Quantitative data from the questionnaire provided measurable evidence of change in students' perceptions, learning attitudes, and engagement levels before and after the intervention. The results indicated a notable increase in students' sense of agency, collaborative learning, and confidence in problem-solving, confirming the positive impact of awareness-based teaching approaches.

The **qualitative component**, based on classroom observations, reflective journals, and focus group discussions, complemented these findings by revealing the lived experiences behind the numerical shifts. The thematic analysis, guided by the **Theory U stages**—co-sensing, presencing, and co-creating - helped trace both the lecturer's and students' evolving mindsets. The lecturer's journey from an **open mind** (seeing with fresh eyes), to an **open heart** (connecting with empathy), and finally to an **open will** (acting from emerging possibilities) mirrored students' increasing readiness to co-own the learning process.

The integration of these findings underscores that educational transformation is not merely methodological but **awareness-driven**. It involves shifting from mechanistic teaching models toward **reflective, participatory, and systems-based approaches** that engage the whole person - mind, heart, and will. The study demonstrates that **awareness-based interventions** - such as reflective dialogue, peer collaboration, and co-created learning prototypes - enhance both teaching effectiveness and student learning outcomes.

Importantly, the results also show that meaningful innovation in education requires supportive institutional ecosystems. School leaders and administrators play a crucial role by cultivating trust, providing mentorship, and sustaining a culture that values inquiry and experimentation.

Based on these findings, several recommendations are proposed:

1. **For Lecturers:** Move beyond traditional delivery methods and engage students as co-creators of the learning experience. Integrate reflective and experiential learning practices that combine conceptual knowledge with personal insight.
2. **For School Leaders:** Build organizational cultures that encourage pedagogical innovation through coaching, professional development, and shared reflection.
3. **For Institutions:** Institutionalize participatory curriculum design and feedback mechanisms that use both qualitative and quantitative data to inform quality improvement.
4. **For the Wider Educational Community:** Join collaborative innovation networks - such as **U.lab hubs** and other Theory U-inspired communities, to share experiences, co-develop educational prototypes, and contribute to the evolution of **Education 4.0**.

In conclusion, this study demonstrates that a **mixed-methods, Theory U-based approach** provides a robust framework for rethinking teaching and learning in higher education. By combining quantitative measures of change with qualitative insights into experience and awareness, educators can gain a more comprehensive

understanding of how transformation unfolds in practice. The journey toward **Education 4.0** begins with cultivating an **open mind, heart, and will**, empowering educators and students alike to co-create learning environments that nurture **critical consciousness, empathy, creativity, and adaptability** - competencies essential for thriving in an uncertain and rapidly evolving world.

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Declaration of Competing Interest

This research article contains my original work, it has not received prior publication, and is not under consideration for publication elsewhere. The author approved the manuscript being submitted. The views expressed are personal. The author is solely responsible for the content and writing of the paper.

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Author Biography

Betty Shitima Bweupe is an educationist and passionate advocate for teaching excellence in higher education. With a strong background in academic leadership, she focuses her research on quality assurance, education management, and institutional development. Her work aims to promote transformative learning environments that foster innovation and continuous improvement in higher education.