

## **Post-COVID-19 Higher Learning: Towards Telagogy, A Web-Based Learning Experience**

Teboho Pitso  
Vaal University of Technology, South Africa

### Abstract

Institutes of higher education (IHEs) have to consider benefits of remote learning post-pandemic. Retrogression to physical contact is counterproductive. The hasty implementation of remote learning during the pandemic deprived IHEs of opportunities to efficiently enact and theorise about it. Post-pandemic, IHEs have opportunities to theorise about remote learning hence the questions; a) what type of learning emerges when asynchronous and technology-as-essence framework undergirds students learning? b) What benefits accrue when chat-Generative Pre-training Transformer (chat-GPT) is infused into students learning? Use of synchronous learning and technology-as-utility framework to underpin remote learning during the pandemic was intended to retain most of physical contact learning traditions. Teachers and students met synchronously and simultaneously online for learning to occur. IHEs safeguarded their operational efficiency to minimise the disruptive nature of remote learning. The purpose of the study was to theoretically examine effects of asynchronous learning and “technology-as-essence framework on students learning. Asynchronous learning occurs when students registered on the same course learn online on their own schedule without any real-time interactions with teachers. This phenomenon occurs when remote learning develops through technological advances that, beyond 2030, would most likely stream educational courses similar to Netflix. One such technological advance is chat-GPT. A study was undertaken to better understand it. 15 multi-disciplinary advanced undergraduates tested out chat-GPT on their assignments and a concrete problem. Chat-GPT lessened the time of doing assignments and improves students’ problem solving abilities. AI systems advances have a positive effect on students learning. The study addresses the positive impact of asynchronous learning and advances in technology on IHEs.

*Keywords:* artificial intelligence, chat-GPT, remote learning, technology, Post-COVID-19 pandemic

The post-pandemic era provides Institutes of Higher Education (IHEs) with opportunities to reimagine learning within the ambit of advanced remote learning. Remote learning refers to a mode of learning that occurs online via scheduled Zoom classes and Bright-space activities because in-person traditional classroom learning was not possible during the Covid-19 pandemic (Burke and Locmele, 2022; Neuwirth, 2021; Torres and Ortega-dela Cruz, 2022). It thrives on synchronous learning where students and teachers meet in live online classes in order for learning and teaching to take place. While occurring online, synchronous remote learning tends to mimic in-person contact sessions. I argue that remote learning that assumes an asynchronous learning approach is likely to help IHEs to reimagine learning in the digital age. An asynchronous approach refers to any mode of online learning undertaken at the behest of students' own schedule and has no need for live online interactions between students and teachers. It shares similarities with heutagogy (Blasche, 2012) where students access learning content as and when they are ready to do so, at their own pace, anywhere and anytime. The brick-and-mortar traditional classrooms are becoming increasingly outdated and would struggle to survive outside online learning. The asynchronous student-centred learning approach with a strong self-determination character that builds students' capabilities to be autonomous, self-reliant, and technologically savvy represents a way forward for IHEs. I refer to this type of online, web-based learning as telagogy. I also forecast that beyond 2030, telagogy would become an asynchronous, online learning experience that would be streamed like Netflix and controlled fully by students as Wright (2020) suggests. Telagogy would also enable students to curate their own personal curriculum drawing educational courses from universities across the entire world. This would compel IHEs to develop universal accreditation systems. It is these meanings of telagogy that make it an advanced form of remote learning. It is anticipated that governments may consider funding students instead of universities.

Another crucial feature of telagogy would be to fundamentally shift the work of human teachers away from textbooks and study guides towards new role demands. Sterling (2020) suggests that university teachers ought to stop trying to write down knowledge that is already available in many AI systems such as chat-GPT and refocus their energies on how to better incorporate these AI and advanced technology capabilities in student learning. Asynchronous approach to learning, in particular, reconfigures human teachers' role in advanced remote learning and is critical in theorising about learning and teaching in the digital age. Options of asynchronous learning for human teachers include posting, developing text or multimedia resources, preparing online polls/quizzes, students' contribution to collectively authored resources and co-creating educational course blogs, creating educational You-Tube videos (Buxton, 2014; Watts, 2016; National Forum, 2020; Butler, 2020). Asynchronous online learning opens spaces to determine future imaginings of remote learning that include online streaming of educational courses, digital accreditation of personal curricula of students, digital assessment, use of new digital learning techniques such as chat-GPT. This would turn higher education into a diverse, interactive, open, engaging activity (Bayne *et al*, 2020) that fosters self-directed learning, peer learning, and student agency (Blasche, 2012; Junco, 2010; Halupa, 2015). Assessment can be reimaged beyond text-based assessments to include audio-clips, videos with evidence of practical projects that solve community problems, animation, and image making (National Forum, 2020). Another key consideration in seeking advanced remote learning features

includes virtual learning environments (VLEs) that have a proven record of use in online learning particularly on content delivery, digital assessment, lecturer-student engagement, and big data analytics (Anderson, 2016). However, VLEs are not without its critics. The platform is seen as constraining pedagogical practices and undermining digital/web literacy practices (Williams, 2023; National forum, 2020). In this study, concerns about remote learning beyond VLEs and synchronous offerings relate to how technology was viewed during the pandemic. Two main approaches that guided the use of technology in IHEs during COVID-19 pandemic were synchronous learning and technology-as-utility anthropological conception. As already stated, these two approaches restricted remote learning to operational efficiency rather than creating conditions for new theorisations about learning and teaching. The implementation of remote learning during the pandemic relied on synchronous, technology-as-utility framework. The post-pandemic technological framework that is likely to help IHEs to reimagine student learning would thus entail asynchronous, technology-as-essence framework (Heidegger, 1954; 1977 Translation) and is the focus of this study.

The purpose of the study is to better understand students' learning post-pandemic under technological conditions of asynchronicity and technology-as-essence framework (Heidegger, 1954; 1977 Translation) that are key constructs in theorising telagogy as an advanced stage of remote learning. Furthermore, the study seeks a qualitative enquiry of process of using one of the latest AI systems called chat-GPT on students' assignments and their attempts to resolve a concrete problem. Two questions that framed the study were thus:

- What type of learning emerges when asynchronous and technology-as-essence framework undergirds students' learning?
- What benefits accrue when chat-GPT is infused into students' learning?

In the next section, the theoretical framework based in literature review is developed in order to ground the systematic investigation undertaken to better understand students' learning post-pandemic. A conceptual framework that shows technological variables necessary to be infused to shape students learning in the digital age follows the description of the theoretical framework. The research that tested out chat-GPT for student learning is also described including its methods, findings, and discussion.

### **Theoretical Framework**

Theories for online learning such as that of Anderson's Online Learning Model (Anderson, 2011) and Picciano's Integrated Online Learning Model (Picciano, 2017) have evolved over time. These models tend to assume a pedagogical framing within a synchronous and technology-as-utility framework. I argue that this theoretical conception of online learning would not lead to advances in remote learning that could culminate in what I call telagogy, or streaming online educational courses. Telagogy is understood as a method and practice of students' web-based learning that draws from remote learning but goes beyond its pandemic conception as synchronous utility. Remote learning was conceptualised and implemented *force majeure* during the pandemic in a hasty way without any meaningful consideration of new theorisations about

student learning. Almutairi *et al*, (2021) developed an emergency remote learning framework that is mostly synchronous and utility-driven as a response to the learning and teaching crisis of the pandemic era. This crisis was created by the pandemic and the results of Almutairi *et al*, (2021) show that multiple pedagogical approaches were used by IHEs human teachers to enable students learning online. The use of traditional methods and practices of teaching such as pedagogy in online learning is increasingly considered as obsolete. Studies on remote learning beyond the pandemic such as those of Alenezi *et al*, (2022), Ndlovu *et al*, (2022) and Tzimiris *et al*, (2023) continue to theorise about remote learning within the emergency, crisis framework dominated by synchronous learning conception and utility-mode use of technology in education. In this article, I argue that post-pandemic era provides IHEs with opportunities to link and develop it beyond traditional methods and practices of teaching such as those maintained in post-pandemic research on learning and teaching. Traditional meanings of teaching come for sharp scrutiny in this article as relics of the past that needs jettisoning. The effort is intended to muster new theorisations about learning and teaching within asynchronous and technology-as-essence framework (Heidegger, 1954, 1977 Translation). Each traditional teaching mode consists of a target (Skelton, 1995), that is, the learning participants and how they are treated in each learning and teaching encounter. This affects the degree of autonomy, self-determination, and independence of students in the learning encounters (Blasche, 2012). The pedagogical models that focus on instruction based on hard-coded knowledge, signify the role of a teacher as an expert, thrive on passive students learning and strict class attendance remain entrenched in most undergraduate studies (Soare, 2012). When remote learning was imposed, IHEs sought to retain most of the features of pedagogy, such as, delivering content as close to in-person learning as possible, making sure that students and teachers met online at the same time, students undertake e-assessment as close as possible to in-person assessment techniques. These pedagogical interpretations of remote learning are retrogressive and *infra dignitatem*, below the dignity of students in IHEs. Heidegger (1954, 1977 Translation) suggests that for technology to be allowed to perform to its optimal level it would enable humans to progress to what Harari (2012) calls a state of homo deus, when humans become deities. There are concerns that such optimisation of technology would turn it into a harmful tool. The first concern relates to superintelligence when advanced technologies would possess an intelligence greater than the one possessed by a genius-level human being (Bostrom, 2014). This concern brings to sharp scrutiny unmitigated growth of technology beyond human comprehension and control. The concern, however, is impervious to the role of IHEs in optimising human intelligence and smacks of scholasticism, narrow-minded commitment to tradition. Superintelligent technologies challenge humans to augment their intelligence and abandon their debilitating traditions and religiosity. Telagogy provides an intellectual cleft to explore human intelligence beyond its current limitations. The basic mission of IHEs is to develop human intelligence and it cannot do so within their limiting traditions. IHEs also need to revise their theoretical interpretation of formal learning as industrialisation of teaching (performativity). Conceptualised as performativity, learning becomes enforcement of industrial rules and regulations, as well as replication of industrial processes with a strong *techne*’ episteme. Such learning still works within authority-subordinate relationships of pedagogy (Peters, 2006). This performativity learning reduces human intelligence to an industrial tool and compromises the huge potential of human intelligence, a source of concern with

superintelligence. Psychologised notions of learning from Piaget (cognitivist) and Skinner (behaviourist) represent IHEs' traditions that ought to be challenged in this century.

This study combines the theoretical interpretations of learning, collectively referred to as theories of independence, self-determination, and autonomy (Keegan, 2013), and include Freire's (1970) critical theory of learning, Invitational learning theory drawn from rhetorics (Pitso *et al*, 2014), and critical pragmatism (Tjabane, 2021). It contributes the concept of and justifies advanced remote learning. Telagogy seeks to empower students to deal with concrete community problems hence use of Empowerment Evaluation research method. It is about developing social justice pioneers that make an impact in communities. Telagogy shifts learning not only from synchronous and technology-as-utility framework but also from the underlying epistemology of mimesis towards *poiesis*, that is, towards developing students' productive thinking, creativity, and innovation. Wertheimer (2020) argues that productive thinking is about gaining insights on a particular concrete problem and using reasoned logic plus evidence to craft a solution. AI systems such as chat-GPT would be beneficial for productive thinking and would reconfigure learning away from in-person contact sessions and teacher-centred approaches. Telagogy describes new roles for teachers (Table 1, below).

**Table 1**

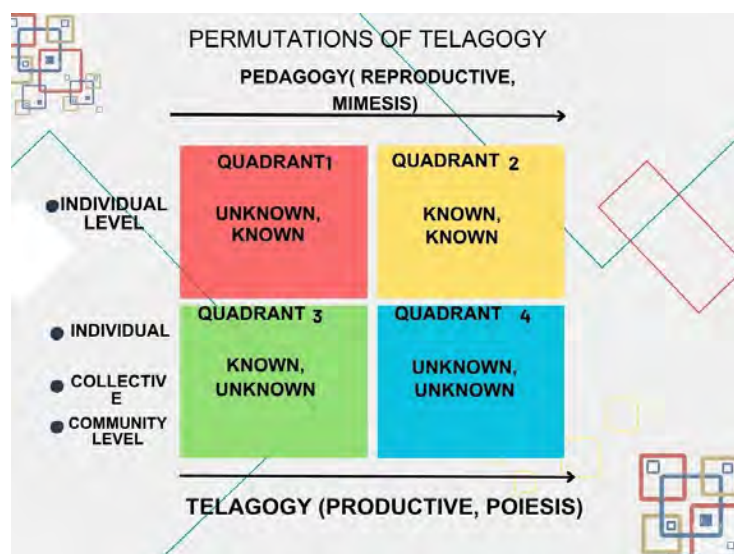
*Theoretical Interpretations of Teaching: Locating Telagogy*

	<b>Traditional</b>	<b>Performativity</b>	<b>Psychologised</b>	<b>Critical</b>	<b>Invitational</b>	<b>Critical Pragmatism</b>	<b>Telagogy</b>
<b>Target</b>	Elite children	Meritocracy	Individuals	Informed Citizenry	Enterprising Individuals	Pragmatic activists	Social justice pioneers
<b>Location</b>	Discipline	Rules & Regulations	Teacher-Learner Relationship	Material Conditions	Material Conditions	Material Conditions	Online Communities & Global Well-being
<b>Epistemic Position</b>	Purist research traditions	Strong pragmatism	Subjective interpretation	Social change	Strong pragmatism	Social idealism	Social idealism
<b>Teacher Role</b>	Subject expert	Standards enforcer	Psycho-diagnostic	Critical intellectualism	Enabler & co-participant	Pragmatic activist	Digital material & online learning techniques developer, automated digital assessment developer, advisory
<b>Purpose</b>	Cultural Reproduction	System efficiency	Effective teaching	Emancipation	Freedom & independence	Just & equitable society	Global citizen + strong ontological reality
<b>Method</b>	Lecture	Work-based Learning	Teamwork	Participatory	Inquiry-driven	Collective problem-solving	Streaming, curation, cloud collaboration, immersive learning

## **Towards Telagogy: Concepts, Contexts, and Content**

The first computer-assisted learning started off in the early 1960s and was called Programmed Logic for Automatic Teaching Operations (PLATO). It represented the initial prototype of learning in a virtual space followed by blended learning, online learning and now remote learning. These computer-based conceptions of learning would undergo, in the next decade, possibly their highest development in the form of online streaming of educational courses along the lines of Spotify or Netflix making new demands on higher learning. Firstly, students are more likely to curate their own curriculum drawing educational courses from universities across the globe and in real time as earlier stated. Secondly, students would study at their own pace, place of preference, anytime as well as anywhere as they undertake e-assessment whenever they are ready. This learning becomes self-directed, self-determined, active, highly flexible, and removes stress in learning. It is positioned at quadrant 3 (Diagram 3, below) that means incorporating all three levels of learning – individual, collective, and local levels. Bowden and Marton (1998) redefined IHEs mission of teaching, research, and community engagement as learning at an individual level (traditionally called teaching), learning at a collective level (research) and learning at a local level (community level). At an individual level, students learn knowledge that is unknown to them but well known by others, experts, and communities of practice. In Diagram 3 below, students move from unknown to known, that is unknown to them as individuals but broadly known knowledge to known, known, that is, students reach a stage of knowing knowledge that is already well known through mostly mimetic, replication learning epistemology. Telagogy does not seek to eliminate individual learning but suggests that this knowledge already exists in AI systems such as chat-GPT. The suggestion is that the first year of study could be dedicated to providing an overview of disciplinary knowledge so that from advanced undergraduate level, students can begin to tackle concrete community problems. Community problems compel for disciplinary knowledge grounding (individual learning), research skills (collective learning) and tackling community problems (local level learning). Once students learn this way then they develop “quality of will”, the scale of commitment to resolving community problems and “knowledge of consequences”, degree of knowing one’s complicity and abdication of responsibility when the community problems remain unresolved. It is argued in this article that community problems are known but ignored and thus remain vague and unattended. In resolving these community problems, students develop productive thinking skills and technological savvy necessary as globe-trotting individuals. It is expected that telagogy, at some point, would pursue blue sky research in quadrant 4.

**Figure 1**  
*Permutations of Telagogy*



Telagogy is based on communities, both online and physical, thus its underlying essence is a community. This is based on the African concept of *letsema/ilima*. *Letsema/ilima* is a collective assembling of community members driven by the spirit of *ubuNtu* (humanness, social justice) to assist those less privileged in a community to stand up, rise and be able to do things for themselves, that is, build a strong *vukusenzele* work ethic, rise and do it yourself. This explains why telagogy needs an infusion of empowerment theory (Zimmermann, 2000). Empowerment requires the following as described by the former Vice Chancellor of the South African University of Cape Town and the co-founder of Black Consciousness Movement, Mamphela Ramphele (2012):

- Substantial shift to global citizenry away from being treated as a subject. This means that one becomes a key agent of change in society who is inspired to tackle societal challenges. In our African context, the journey to citizenry begins with a critical awareness of woundedness from years of colonial ravages not only on land but also on African collective dignity. Approaches to learning, in the African context and Global South, have to take account of the deep-seated inequality and poverty hence the need for the *letsema/ilima* circle model that leverages firstly, the critical awareness of existing resources, knowledges and insights within a community that unleash citizens fortitude to tackle their own problems. Secondly, generate ideas through ideational bricolage that can be converted to real solutions of pressing community problems. Ideational bricolage is the explicit identification of idle resources within a community that could help find solutions to pressing problems. Thirdly, apply solutions to address identified community problems. Once the circle is completed then it can be iterated.
- Develop a strong sense of autonomy, capabilities to do things on their own to gain *vukusenzele* work ethic. This is similar to Zimmermann's (2000) theory of empowerment. Empowerment theory refers to a situation where communities or

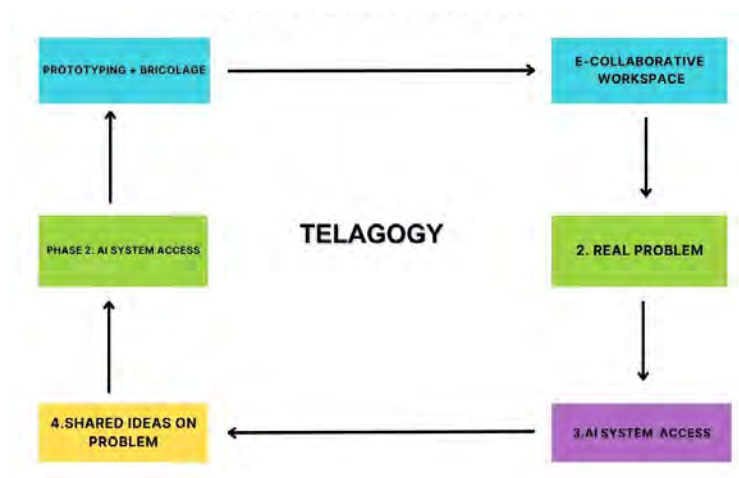


individuals overcome their psychological oppression, become increasingly aware of community problems and combine their capabilities to resolve these problems driven by a strong *letsema/ilima* motif and the notion of *vukusenzele* work ethic. This meaning of empowerment goes beyond the traditional psychological conception of empowerment as increased self-esteem, self-efficacy, self-actualisation competences and locus of control (Perkins, 1995, Zimmerman, 2000, Silverton, 2018).

Another area of telagogy worth our attention is the use of chat-GPT in influencing various aspects of students' learning. Studies have focused on student and teacher perceptions of chat-GPT use, possible plagiarism and how it affects students' motivation (Munoz *et al*, 2023). It is also seen as critical in shifting students' learning towards innovation and creative problem solving. Advanced technologies have "ushered in a new era of innovation and creativity in several disciplines, including education" (Munoz, *et al*, 2023: 3). Studies show that when chat-GPT is prompted for answers for assignment completion, it provided accurate responses to the prompted assignment question (Patel, 2023; Halaweh, 2023). Some universities are already developing guidelines for use of chat-GPT in assignments. In this study, the relationships between chat-GPT and student assignments was probed in terms of time of assignment completion and how it assisted students to solve concrete problems. Figure 2 below describes these relationships. In the first instance, students test chat-GPT for the assignments given to them in their respective courses and as they do so, students measure the average time it takes them to complete each item of the assignment and compare it with the average time of doing the assignment manually. In the second instance, students prompt chat-GPT to assist them to frame a concrete problem in ways that helps them develop possible solutions. This includes prompting for innovative solutions.

The starting point of the conceptual framework designed to investigate chat-GPT is an e-collaborative workspace assembled in similar fashion as *letsema/ilima* and applying the *vukusenzele* work ethic. *Letsena/Ilima* e-collaborative workspaces are voluntary and self-determined, empowering community practices (Lebeloane and Baffour, 2008). In these assemblages, students meet to resolve a theoretical or practical problem in a collaborative environment employing the work ethic of *vukusenzele* meaning arise and do it yourself in lieu of being dependent on another person or conditioned to believe that another person has to be in charge in order for a problem to be solved. In the context of students' learning, it marks a major shift towards students' agentic power in the act of learning. Learning, under these conditions, proceeds on the basis of either a theoretical or real problem. It involves further prompts for chat-GPT on possible innovative solutions. Telagogy would be based mainly on e-collaborative spaces that challenge real problems and less on theoretical problems. It has strong shared ideas and shared solutions approaches to real problem solving. The next section describes in detail a study using chat-GPT.

**Figure 2**  
*Diagram of Telagogy*



### Methodology and Methods

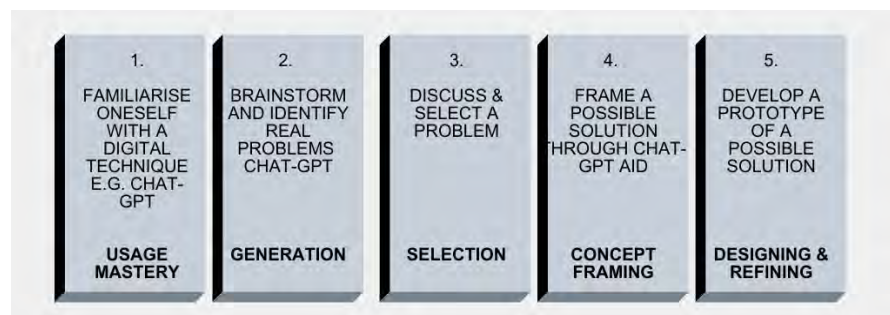
The study is based on Empowerment Evaluation (EE) research method. It is an approach to research that helps participants to not only identify variables or gaps in literature that compromise ongoing project's performance but also provides possible solutions to these problems (Zimmermann, 2000; Fetterman, 1994; Fetterman, 2019). It makes use of qualitative, quantitative, and even mixed methods approaches. The participants were drawn from a pool of advanced undergraduates from Chemical Engineering (N=5), Logistics (N=5), and Accounting (N=5) through use of a purposive sampling. Patton (2002) defines it as selection of data-rich cases for effective use of limited resources. Teachers of second and third-year students were approached in each respective discipline to recommend students that could participate in the study. It was emphasised that, in line with the ethical clearance, students would participate voluntarily in the study and could leave anytime without any repercussions.

A qualitative EE method called Participatory Evaluation Design was used in this study which consisted of the following phases: training, illumination, facilitation, advocacy, and liberation (Fetterman, 1994). Step 1 of the research design involves responsible planning which entails involving research participants in planning the research. In this phase, students elaborate on their understanding of chat-GPT, its use, and practical applications in their learning. For those who had not been exposed to chat-GPT (about 30% of participants), basic training on use of chat-GPT was conducted. It was downloaded on the laptops, provided to them during the COVID-19 pandemic. Participants trained one another on the use of chat-GPT in their various assignments. This training session was intended to forge collaboration and identify group dynamics in team formation as per the framework developed by Pitso (2020) - pre-connectivity connectivity, early superficial learning, intense interactivity, maturing, deep learning, and resolution. These team formation stages were also intended to serve as an analytical tool for interpretation of collected data. The researcher intended to become a keen observer who interviewed participants in each stage of team formation. Observation included carefully noting participants' interactions, particularly points of agreement, differences, and emerging themes

of cooperation, democratisation of the collaboration space, inclusivity, openness, and degree of flexibility and reflexivity. Interview questions covered issues relating to participants' solicitation of community views on the problem they sought to resolve, their experiences from this research and overall participation in the collaboration. Step 2 and step 3, involved finding out whether participants show a strong sense of owning the process, inclusivity, flexibility, and openness to use and discuss issues relating to chat-GPT. Written semi-structured interviews were conducted. Thereafter, participants were allowed to identify and select concrete problems drawn from their own experiences and had to agree to tackle only one problem for the purpose of this research study. The problem had to emanate from a local community as one of the requirements of the study was for participants to solicit views of select community members. Once such a consensus on a concrete problem was reached, participants prompted chat-GPT to gain better understanding of the problem. Participants also visited a local non-profit organisation to find out its views on the problem at hand. These interviews at the local non-profit organisation were conducted once but ideally, it is suggested that more follow-up interviews are necessary. These stages of research are called illumination and facilitation respectively.

In step 4, students develop a solution prototype and showcase it (advocacy). In the last step, students find a sense of satisfaction for resolving or creating conditions for the resolution of a social problem, "quality of will" and the consequences of their actions are positive (liberation). Written interview schedules were administered to students during the study and post-study. Post-study interviews were intended to check lessons learned and whether participants were ready to embrace learning based on productive thinking, empowerment theory and AI systems.

Issues of validation of research are equally relevant in EE research methods and take the form of qualitative trustworthiness despite Fetterman's (1995) argument that they are less important in empowerment discourses. Truth-value and acknowledging inherent biases in qualitative research designs and sampling techniques are essential in legitimising qualitative research (Noble & Smith, 2015). Truth-value refers to verifiability or falsity of a claim and triangulation or corroboration serves to make a determination of the veracity or mendacity of a claim. Use of two sources of data – observation and interviews – was considered adequate to corroborate for verifiability. Accounting for possible biases was also done carefully, in addition to auditability meaning providing clearer and transparent description of the research process (Noble & Smith, 2015). Finally, there was a need to describe the context of the study and offer thick as well as rich verbatim descriptions of participants' views in support of findings.

**Figure 3***EE Participatory Evaluation Design*

## Results

Data collected in a qualitative study of 15 students that participated in testing the efficacy of chat-GPT in students' assignments and its use in solving a concrete problem were analysed to determine:

- The relationship between students' duration of completing an assignment using chat-GPT as compared to manual completion of an assignment plus potential for plagiarism.
- The relationship between students' use of chat-GPT in attempting to solve a concrete problem and the time of finding solutions was qualitatively tested through interviews with participants. The interviews also included perspectives on whether concrete problem solving helped them become innovativeness.

The variables such as age, socio-economic status of students, level of experience in using AI systems and students' nominal-scale variables such as gender, ethnicity and race were not considered for any meaningful analysis. This was essentially a qualitative, exploratory study. It was intended to demonstrate how AI systems and empowerment theory infused into learning and teaching could enhance better understanding of AI systems and their applications in IHEs within the framework of technology-as-essence. This framing of technology could allow remote learning to develop to its next level of online streaming and thus provide opportunities to theorise about learning and teaching beyond its current limitations.

The interview data shows that 70% of the participants, although it was not a consideration when recruiting, were already using chat-GPT for assignments and were aware of the plagiarism consequences so avoided copying answers from chat-GPT. Most participants indicate that they have had to include in their answers to assignments, information from other sources and curate such knowledge to fit assignment demands. "you gotta realise and become aware of penalties linked to copied text so adjust your answers accordingly" commented one of the participants. In the use of chat-GPT, participants showed a good understanding of plagiarism rules and made effort not to copy answers given to them by chat-GPT. These interviews also show that chat-GPT substantially reduces the time to complete assignments based on existing knowledge and is also capable of suggesting innovative ideas when the

problem is sufficiently specific. When asked whether participants found chat-GPT helpful, one participant commented “chat-GPT saves time and allows one to focus on other things.”

The students found the first stage of the EE method quite useful in familiarising themselves with chat-GPT particularly those who were using it for the first time. While chat-GPT did not substantially reduce the time for completing projects based on a concrete problem, it was useful in clarifying the problem at hand which assisted students’ discussions on framing of the problem.

In another study, chat-GPT proved to be better than students at creative problem-solving (Webb *et al*, 2023). In this study emphasis was on productive, creative problem-solving. The meaning of a problem offered by engineering students as a gap between a current situation and a desirable one was quite useful to students’ analysis of a concrete problem. A number of factors were identified that caused a current situation to be less than desirable and the ideal situation was described prior to seeking solutions even before prompting chat-GPT. My further observation of participants in attempting to do their project was analysed in terms of Pitso’s revised group dynamics process as used for human-machine collaborations (Pitso, 2020). The Smart Team Formation Process (Pitso, 2020) includes:

### ***1. Pre-Connectivity***

This stage involves students familiarising themselves with an AI system under investigation (chat-GPT) and its role in assignments or problem-solving. It also indicates, in early formations of the collaborative team, some anxieties, scepticism, doubt and cynicism from participants concerned with whether a multi-disciplinary team could work together given its diverse knowledge bases and experiences. My observation of this team was that the use of chat-GPT for purposes of familiarisation, stage one of the method, tends to bring the participants closer when they all participate in using chat-GPT to find answers for assignments of one group. For instance, when all of them become involved in seeing how Chat-GPT answers those specific engineering assignments it helps bridge epistemic distances between students and enhances their co-operative spirit in the collaboration spaces. “I never thought I could be involved in an assignment from other courses, this was interesting”, a comment from a participant. When introduced to a real, concrete problem, students have already begun to create some understandings of how their discussions should proceed. I observed a greater understanding in using chat-GPT and the increased confidence in the answers prompted from chat-GPT and the realisation that chat-GPT contains terabytes of great content that helps them better understand the problem at hand (Stirling, 2020).

### ***2. Connecting/Connectivity***

An increasing interest in the use of chat-GPT to solve a concrete problem helped to reduce apprehension and doubt in the interactions between participants and chat-GPT. Pitso’s (2020) study on group dynamics suggests that teams function better and interact with AI systems confidently when there is a clear and lucid project that students

undertake. It is in this stage that students discussed various community problems that could be their project. Participants settled on potholes that have become a major problem in the South African context compromising logistics and general well-being of communities. When prompting chat-GPT on the meaning of a pothole, the following responses were given by chat-GPT: [A type of a road surface damage that usually appears as a depression or hole. It is usually caused by wear and tear, weather conditions, or the deterioration of road surface. Potholes can vary in size and shape ranging from small, shallow depressions to larger, deeper holes. Potholes form when moisture seeps into the road's surface weakening the underlying layers]. While road maintenance and repair falls under the local government purview, most of them are dysfunctional leading to persistent potholes problems. The most important issue about the project is that none of the participants are trained on the particular problem at hand and have to test the limits of their knowledge and experience. *"I found the explanations of a pothole quite useful and easy to find in chat-GPT"*, one of the participants commented. There was also an increasing confidence that the problem at hand could be solved given the role of chat-GPT in providing ready-made answers.

### **3. Early Superficial Learning**

Participants further probed chat-GPT on possible solutions with the following responses: [patching for smaller holes, it involves filling the hole with materials such as asphalt. Potholes filling machine...to fill potholes with hot asphalt. Cold mix asphalt, ready to use mixture. Resurfacing or overlaying, add new layer of asphalt on existing pavement. Proper road maintenance. Advanced road construction techniques such as durable materials, better drainage systems, and proper designs.]. While these suggestions were important, most of them were at a level of municipalities that required huge resources. Participants felt constrained by these chat-GPT responses. This was a crucial moment where participants were exposed to which also showed the limits not only of chat-GPT but also of reproductive knowledge. The greater realisation of the superficiality of such information and inadequacies in helping participants to solve a pressing problem meant that participants had to go beyond current solutions of pothole filling.

### **4. Intense Interactivity**

Participants were increasingly becoming aware that chat-GPT had its own limitations in responding to some of the questions: "Obviously chat-GPT is unable to give us all answers", commented a participant. Yet, this was a crucial moment when students ought to interact more intensely with chat-GPT to find possible solutions. My observations confirm, the problem with participants at this stage, was that they have rarely been involved in activities that transcend their reproductive thinking box. Intense interaction with chat-GPT was restricted not by capabilities of chat-GPT but by participants' mastery of known knowledge which now proceeded to the use of chat-

GPT within the same reproductive vein. There was a need for epistemic border crossing not at a level of disciplines but at the level of participants' mindset.

### **5. *Maturing***

There was, however, greater focus on the project at this stage and participants were able to overcome personal concerns, anxieties, and cynicism. The interview questions focused on how participants felt at this stage of the study. "We are frustrated because chat-GPT answers are for the municipality and we are expected to try out our own solutions". It is important to note that the response relates to a project and no longer on participation and initial use of chat-GPT. This was an important development towards participants' sense of growth and learning.

### **6. *Deep Learning***

The frustration with chat-GPT presumed inadequacies which, in essence, emanated from participants' reliance on hard-coded knowledge, although there was a need to explore possible solutions outside this knowledge. Deep learning works on unsupervised forms of learning which is commonly called machine learning capability where AI systems are employed to help resolve real world problems known for their complexity, uncertainty and unpredictability. This was an overwhelming experience for participants and I have had to, as an active netnographic lurker, suggest that participants prompt chat-GPT for innovative solutions to potholes filling and one of the responses included self-healing potholes. This idea fascinated participants who wanted to know more about it. The participants then prompted chat-GPT on self-healing potholes. [These innovative technologies allow potholes to repair themselves without the need for human intervention. Researchers are working on engineering asphalt mixes that have the ability to self-heal. Some studies explore the use of bacteria that produce calcium carbonate]. Participants, in their discussions had a strong propensity to research this area of potholes further and involve Chemistry students. This is how far the study could go with a huge potential for participants to be at the forefront of crafting innovative solutions.

### ***Resolution***

This is the stage where participants develop prototypes on the unique idea they have established. In the case of the study, participants would have joined the exploration of self-healing potholes but brainstormed alternative asphalt mixes that do not include the ones suggested by chat-GPT. They could also have calculated the costs of the idea and made their findings public through showcasing. However, participants were unable to reach this stage because of time constraints.

## Discussion

The purpose of this study was to develop better understanding of remote learning as a “new normal” in learning and teaching post-pandemic as well as explore possibilities of its advanced form. The data collected in this study is of a qualitative nature making for lack of generality and precision. However, conclusions of this study are relevant and important to IHEs struggling to progress to the next level of remote learning and consider in-person contact sessions as relics of the past. The synchronous remote learning conceptualised within technology-as-utility framework is not sustainable given the impact of AI systems on learning and teaching that increasingly shifts learning control to students. In this study, there was strong indication of students taking active control of their learning through deciding their own project, moments of prompting chat-GPT, discussions, suggestions and probing possible solutions. Post-study interviews with participants show gain in greater control of their own learning. This is the most important and emerging advantage of remote learning. I argue that remote learning would lead to even greater student control when it is conceptualised as asynchronous and AI systems development occurs within technology-as-essence framework. This would enable students to decide when to access educational courses and projects, including from any university, decide on when to take examinations and from anywhere. When questioned post-study on the meaning of this possibility, participants were a bit skeptical. This shows that it takes more time to shift from tradition to new spaces of development. My observations of confident students tackling a real problem and post-study interviews showed a glaring gap between attempts of research and reality as well as the power of institutional cultures. There is a glaring gap in research on AI systems that needs further investigation. For example, the slow embracing of AI systems by participants particularly in terms of infusing them into their practices and the benefits accrued by students when using AI systems.

Participants also showed a positive progression through different stages of team formation process. My observation shows that participants, with minor variations, were able to demonstrate features of each stage of this process. Chat-GPT showed potential in finding innovative solutions to a real problem. Students were also able to sidestep plagiarism by not only rewriting chat-GPT prompts but also included additional information from the textbooks.

## Conclusion

The traditional focus of undergraduate studies on mastery of universal hard-coded knowledge mostly bereft of cognitive content of communities of origin or of interest to students require serious attention (McGhie, 2012) given that hard-coded knowledge is already available in AI systems such as chat-GPT. There is no point in trying to take students through this hard-coded knowledge over the stretch of three years when the use of chat-GPT in the first year of undergraduates studies could cover it within a year. Advanced undergraduate studies could then focus on the development of productive thinking through focus on concrete community problems with a strong understanding that learning is socially situated and constructed (Akpan *et al*, 2020). Productive thinking thrives on a Gestalt, holistic approach that concrete community problems offer. Other studies on socially situated and constructed learning



accentuate learning that is a social and cultural process occurring in the context of human relationships and activities. This view assumes that a socio-cultural context should be the basis of student participation in the affairs of their communities, first summon knowledge from within these communities and supplement it with formal hard-coded knowledge (Lave and Wenger, 1991; Akpan *et al*, 2020). The traditional undergraduate studies that focused on “in-the-head” learning that tended to reduce human mental potential to information-processing machine and a storage device with a strong memory strength that contained highly developed retrieval mechanisms has come under intense pressure in this era. AI systems have rendered this approach to learning unnecessary as such knowledge can now be easily accessed via AI systems. The undergraduates’ mind can be put to better use which, actually, could play a positive role in their communities. New learning that is suggested in this article referred to as telagogy draws significantly from learning that emphasises students’ collaborative effort that leverages their interactions, knowledge sharing, collective research, critical discussions and use of AI systems in attempts to resolve concrete community problems. Telagogy is therefore, an online streaming of educational courses sourced from various universities across the globe and available for access anytime and from anywhere. It makes use of advanced AI systems such as chat-GPT to curate and prepare knowledge for creative complex responsive processes that include localised insights and resources for creative, complex responsive processes. It needs further research and development.

## Recommendations

The investigation undertaken in this article was twofold. It sought to better understand students learning from the asynchronous and technology-as-essence framework. The investigation sought to transcend remote learning research that tended to lock its debates on emergency/crisis remote learning implementation during the pandemic. It is suggested that further research is necessary to qualitatively and quantitatively investigate the efficacy of this framing of students’ online learning as asynchronous and open to being shaped by continual advances in technology. There is also a need for IHEs to develop guidelines for use of AI systems such as chat-GPT on enhancing students learning. Advanced remote learning offers opportunities for IHEs to shift undergraduate studies away from mimetic epistemologies of replication to *poiesis* with a strong motif of creativity, innovation and complex problem solving. This also shift students’ learning from developing reproductive thinking towards productive thinking. The suggestion is that reproductive thinking can be developed in the first-year of students learning and advanced undergraduates ought to increasingly focus on productive thinking. EE research methods also need to be refined to fit into researching learning and teaching.

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**Corresponding author:** Teboho Pitso

**Email:** [biki@vut.ac.za](mailto:biki@vut.ac.za)